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ABSTRACT

This set of instructional materials provides secondary and postsecondary students with an opportunity to explore the career choices available in the parts merchandising industry. The skills presented are useful to any student pursuing a career in auto parts, heavy equipment parts, small engine parts, tractor parts, appliance parts, or for any merchandising system where parts are warehoused, shipped, inventoried, displayed, and sold. Introductory materials explain the use of this publication and provide the following: competency profile; instructional/task analysis; related academic and workplace skills list; tools, equipment, and materials list; reference list; and glossary. Each of the 14 instructional units includes some or all of the following basic components: objective sheet, suggested activities for the teacher, answers to assignment sheets, answers to written test, written test, unit evaluation form, teacher supplements, transparency masters, information sheet, student supplements, assignment sheets, and job sheets. Units of instruction are designed for use in more than one lesson or class period of instruction. Unit titles are as follows: the parts specialist; human relations; work communication skills; basic workplace safety and first aid skills; applied math for parts specialists; automotive parts and systems identification; small engine parts and systems; tools and fasteners; measuring; stocking, shipping, and receiving; inventory control; cataloging and pricing; sales policies and procedures; and sales promotion. (YLB)

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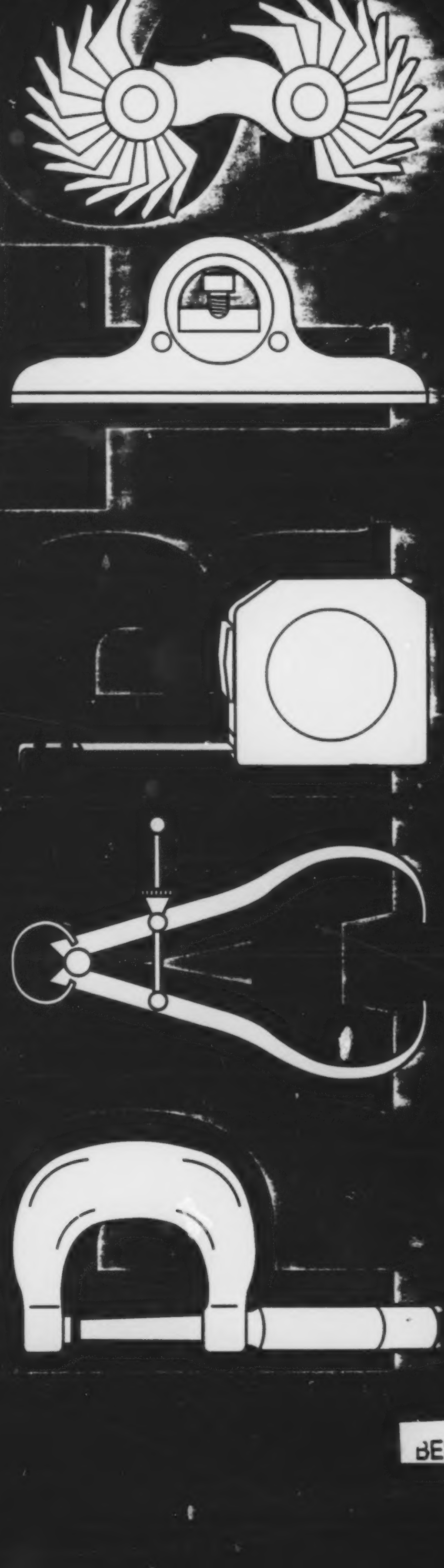

SPECIALIST

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Teacher Edition

MAVCC

Parts Specialist
Second Edition

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Parts Specialist

Teacher Edition

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Foreword

When MAVCC began the process for revising *Parts Specialist* we wanted to develop a set of instructional materials that would provide secondary and post-secondary students an opportunity to explore the career choices available in the parts merchandising industry. Much has been said about the need for students to have basic cognitive (knowing), psychomotor (doing), and affective (attitude) skills necessary to be successful in the workplace. After students complete *Parts Specialist, Second Edition* they should have the entry-level skills necessary to enter any parts merchandising system..

The skills presented in *Parts Specialist, Second Edition* will be useful to any student pursuing a career in auto parts, heavy equipment parts, small engine parts, tractor parts, appliance parts, or for any merchandising system where parts are warehoused, shipped, inventoried, displayed, and sold. This publication addresses the many skills a good parts specialist must master in order to be effective in the market place. Some of these skills involve the use of computers, catalogs, and other references used in finding parts. But a good parts specialist also requires skills in math and measuring, skills in identifying parts needs and the tools their repair or replacement require, and skills in handling business forms that keep track of the processes of busy industry. *Parts Specialist, Second Edition* addresses all of these workplace requirements as well as the important aspects of workplace safety and the communication and customer relations skills to be a successful parts specialist.

The success of *Parts Specialist, Second Edition* is due in large part, to the capabilities of the personnel who worked with its development. Appreciation is extended to them for their contributions to the publication.

These instructional materials are designed for student use and to assist teachers in organizing and improving instruction. These instructional materials are based on the curriculum alignment concept of first stating the objectives (objective sheet), developing instructional strategies for teaching to those objectives (information, assignment, and job sheets), and assessing to those same objectives (criterion-referenced evaluation instruments).

Every effort has been made to make these materials basic, readable, and by all means, usable. As with all of MAVCC's instructional materials, teachers much localize and personalize these materials to meet their community, classroom/laboratory, and individual students situation. Teachers are encouraged to supplement the instructional materials and to develop strategies for motivating their students.

Special attention should be given to the matrix identifying basic academic skills being reinforced in these instructional materials as well as the suggestions on ways to increase reinforcement of academic and workplace skills. By reinforcing these skills, the instructor should assist students in improving their employability skills.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please call or write us.

Ann Benson, Chairman
Board of Directors
Mid-America Vocational
Curriculum Consortium

Jim Steward
Executive Director
Mid-America Vocational
Curriculum Consortium

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Appreciation is extended to the many individuals who contributed their time and talent to the development of *Parts Specialist*.

The revision committee which reviewed the original publication deserves a special thank you. That committee includes:

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Well-deserved thanks also go to the many auto and power equipment parts professionals and parts manufacturers who shared their expertise and resources generously with the writer and editor. This list includes: General Motors Corporation, Service Technology Group, Warren, MI; Triad Systems Corporation, Livermore, CA; Larry Ricker, Wilson Chevrolet, Stillwater, OK; Larry Paxton, Janzen Oldsmobile, Stillwater, OK; and Main Auto Supply, Stillwater, OK.

Special appreciation is extended to the Curriculum and Instructional Materials Center of the Oklahoma Department of Vocational-Technical Education, Stillwater, Oklahoma, for permission to reprint various photographs and illustrations that appear in units 6 and 9 of this publication.

Appreciation is also expressed to the employees of the Graphics Division of the Oklahoma Department of Vocational-Technical Education for the artwork, phototypesetting, and printing of this text. Special thanks to Kim Hale for designing the *Parts Specialist* cover.

A final thank you to Jane Huston for coordinating and editing the project.

Use of Introductory Materials

Introductory materials are included in the teacher edition only and contain useful information to assist administrators and teachers in planning for instruction.

In addition to the general information such as the table of contents, foreword, and acknowledgements, information is included on the following:

1. **Use of this publication**—Explains the components of a unit of instruction and how they should be used as part of the teaching/ learning process.
2. **Competency profile**—Provides a record of student performance for each task included in a unit of instruction. This becomes a part of the student's permanent records and should be utilized when directing the student toward employment opportunities.
3. **Instructional/task analysis**—Provides a quick review of contents of the publication; identifies cognitive (knowledge) skills and psychomotor (doing) skills addressed in each unit of instruction.
4. **Related academic and workplace skills list**—Classifies unit tasks (assignment sheets and job sheets) according to related academic and workplace skills being reinforced. Skill areas reflected by skill groups, sub skills, and descriptions have been identified using *Workplace Basics: The Skills Employers Want*, developed by the American Society for Training and Development (ASTD) and the U.S. Department of Labor and adapted by MAVCC.
5. **Tools, equipment, and materials list**—Provides a comprehensive list of those items needed to successfully complete the assignment sheets and/or job sheets; assists administrator/teacher in determining program costs.
6. **Reference list**—Provides a comprehensive list of resources used in the development of this publication.
7. **Glossary of terms**—Provides a comprehensive list of terms and definitions found in Objective 1 of all units of instruction.

As you use these materials, it is hoped that they will provide useful information to meet a variety of needs.

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Use of This Publication

Instructional units

Parts Specialist contains fourteen units of instruction. Each instructional unit in a teacher edition includes some or all of the following basic components of a unit of instruction: objective sheet, suggested activities for the teacher, answers to assignment sheets, answers to written test, written test, unit evaluation form, teacher supplements, transparency masters, information sheet, student supplements, assignment sheets, and job sheets.

All of the unit components focus on measurable and observable learning outcomes. Teachers are encouraged to supplement, personalize, localize, and motivate with these materials in order to develop a complete teaching/learning process.

Units of instruction are designed for use in more than one lesson or class period of instruction. Careful study of each unit of instruction by the teacher will help to determine the following:

- Amount of materials that can be covered in each class period.
- Skills that must be demonstrated.
- Amount of class time needed for demonstrations.
- Amount of time needed for student practice.
- Supplementary materials, including print and nonprint media and equipment and supplies, that must be ordered.
- Resource people who must be contacted.

Objective sheet (Color code: White)

Each unit of instruction is based on performance objectives which state the goals for successful completion of the course. These performance objectives are stated in two forms: unit objectives which state the expected performance of each student after completion of the unit of instruction, and specific objectives which state what the student must do to reach the unit objective.

The objectives should be provided for students and stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Teachers should prepare for each unit by deciding how each objective can best be taught.

Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the teacher should remember to supply the needed information, assignment and/or job sheets, and criterion test items.

Suggested activities (Color code: Pink)

This component is included only in the teacher edition. The suggested activities assist teachers during the preparation stage of the teaching/learning process by providing an instructional plan, teaching suggestions, and a list of supplemental resources. Ways to integrate academic and workplace skills have been included in the teacher suggestions, and skill areas have been noted in bold. (A table of academic and workplace skills with accompanying definitions has been provided on page xv.) The teacher should read the suggested activities before teaching the units and decide how each objective can best be taught. Time should also be allowed to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the teacher will vary according to the particular unit.

References used in the development of each unit are listed in the suggested-activities section, along with suggested supplemental resources that may be used to teach the unit. These materials can be used by the teacher to supplement her or his knowledge of the subject area or to help students with particular interests or objectives in the area covered.

Instructions for evaluating student performance on the job sheets are also included in the suggested-activities section. Teachers should select and discuss with students the rating scale that will be used.

Assignment and written test answers (Color code: Pink)

Assignment-sheet answers and written-test answers are designed to assist the teacher in evaluation of student performances.

Written test (Color code: Yellow)

This component provides criterion-referenced evaluation of every cognitive objective listed in the unit of instruction. The test appears in the teacher edition only, but duplication is permitted for student use. If objectives have been added, deleted, or modified, appropriate changes should be made on the written test. It is recommended that the tests be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of test items from the units covered may be used for final tests at the end of each term if desired.

Unit evaluation form (Color code: White)

This sheet provides teachers with a record of each students performance on a unit of instruction. It includes space for assignment sheet ratings, job sheet ratings, written test scores, and teacher comments. The unit evaluation form is included in the teacher edition only, but may be duplicated.

Teacher supplements (Color code: White)

This component is included only in the teacher edition. Teacher supplements are optional materials for the teacher to use. They have three purposes: to provide the teacher with higher level materials to stretch the advanced student, with remedial information or practice to assist the less-advanced student, and with state-of-the-art information in which the teacher may not have background or with information that is not readily available in other books. Some teacher supplements may be duplicated for student use and are marked accordingly.

Transparency masters (Color code: White)

Transparencies are included in the teacher edition only and are used to direct the students' attention to the topic of discussion. They may provide illustrations, charts, schematics, or additional information needed to clarify and reinforce objectives included in the unit of instruction.

Information sheet (Color code: Green)

The information sheet provides the content essential for meeting the cognitive (knowledge) objectives of the unit. Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. Students should read the information sheet before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide information for the teaching of each objective.

Student supplements (Color code: White)

Student supplements are included in the student edition. The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment and/or job sheets. Students are not directly tested over the information presented in a supplement; however, their ability to apply this information may be evaluated in the completion of assignment sheets and/or job sheets.

Assignment sheets (Color code: Tan)

Assignment sheets provide students with pencil and paper activities that give students the opportunity to make practical application of the knowledge in the information sheet. Criteria are provided to objectively evaluate student performance.

Job sheets (Color code: Blue)

The job sheets provide criteria to objectively evaluate student performance, a list of required equipment and materials, and a step-by-step procedure for performing a psychomotor skill. The teacher should discuss the equipment and materials available in the classroom and/or laboratory and demonstrate the procedure prior to having students practice procedure. When a student is ready to be evaluated, the teacher should follow instructions for evaluating student performance which may be found in the teacher edition.

Job sheets are an important segment of each unit. Job sheets provide potential employers with a picture of the skills being taught during training and the performances that might reasonably be expected from an individual who has had this training.

Disseminating material

Material may be given out a unit or page at a time to keep the material before the student always new. Some teachers ask students to furnish a three-ring binder or folder for the current unit of study. This is convenient for students taking the material home to study. Upon completion, each unit is then placed in a larger binder. Some teachers prefer to store the material by unit in filing cabinets or boxes until needed.

For best results, provide student materials for each student. Student editions contain objective sheets, information sheets, student supplements, assignment sheets, and job sheets. Students should be allowed to take their materials home at the end of the course.

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Academic and Workplace Skills
(Classifications and Definitions)

Skill Groups	Sub Skills	Definitions
Learning Skills	Learning to learn	Developing ability to apply knowledge to other situations; knowing how to learn.
Foundation Skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task.
	Writing	Communicating a thought, idea or fact in written form in a clear, concise manner.
	Math	Applying computation skills such as reasoning, estimation, and problem solving as they are actually used on the job.
	Science	Applying knowledge learned through study or practice that is based on scientific principles as they relate to specific tasks.
Communication Skills	Listening	Listening for content, conversation, long-term contexts, emotional meaning, and directions.
	Oral communication	Communicating a thought, idea, or fact in spoken form in a clear, concise manner.
Adaptability Skills	Creative thinking	Using imagination to create something new—i.e. an idea, invention, work of art.
	Problem solving (critical thinking)	Recognizing and defining problems, inventing, and implementing solutions, and tracking and evaluating results.
Personal Management Skills	Self-esteem	Developing self-confidence and creating a positive self-image.
	Motivation/goal setting	Setting and meeting defined goals and objectives.
	Personal and career development	Emphasizing self-direction by establishing and implementing a plan.
Group Effectiveness Skills	Interpersonal relations	Developing ability to maintain positive relations with others.
	Negotiation	Resolving conflict between two or more individuals.
	Teamwork	Working together in a group to reach a common goal.
Influence Skills	Organizational effectiveness	Adapting to the organization's goals, values, culture, and traditional modes of operation.
	Leadership	Directing/influencing group in performance of a specific task; accepting responsibility for others.

Parts Specialist

Competency Profile

Name: ______________________________

Directions: Evaluate the student using the rating scale below. Write the appropriate number to indicate the degree of competency achieved. The descriptions associated with each of the numbers focus on a level of student performance for each of the tasks listed. The written test scoreline is provided for optional teacher use. It may not be applicable in all cases.

Option A

Rating scale:
4 - Skilled - Can perform job with no additional training.
3 - Moderately Skilled - Has performed job during training program; limited additional training may be required.
2 - Limited Skill - Has performed job during training program; additional training is required to develop skill.
1 - Unskilled - Is familiar with process, but is unable to perform job.
0 - No Exposure - No information or practice provided during training program, complete training required.
NA - Non-applicable.

Option B

Yes - Can perform with no additional training
No - Is unable to perform satisfactorily

Unit 1: The Parts Specialist

______ 1. Interview a parts specialist.
______ 2. Write a report about parts specialist as a career.
______ 3. ______________________________

______Written Test Score

Unit 2: Human Relations

______ 1. Conduct a personality survey of a salesperson at work.
______ 2. Determine how behavior affects job performance.
______ 3. Apply human relations skills in work-related situations.
______ 4. ______________________________

______Written Test Score

Unit 3: Work Communication Skills

______ 1. Identify your listening behaviors.
______ 2. Follow verbal directions.
______ 3. Follow written directions.
______ 4. Give verbal directions while demonstrating a task.
______ 5. Take a telephone order.
______ 6. ______________________________

______Written Test Score

Competency Profile (Cont.)

Unit 4: Basic Workplace Safety and First-Aid Skills

______ 1. Complete a safety inspection.
______ 2. Interpret material safety data sheets.
______ 3. Analyze scenarios to determine appropriate safety practices.
______ 4. Lift a heavy object properly.
______ 5. Place and climb a ladder safely.
______ 6. ______________________________

______Written Test Score

Unit 5: Applied Math for Parts Specialists

______ 1. Add whole numbers.
______ 2. Subtract whole numbers.
______ 3. Multiply whole numbers.
______ 4. Divide whole numbers.
______ 5. Reduce fractions to lowest terms.
______ 6. Convert fractions and mixed numbers.
______ 7. Add fractions.
______ 8. Subtract fractions.
______ 9. Multiply fractions.
______10. Add decimal numbers.
______11. Subtract decimal numbers.
______12. Multiply decimal numbers.
______13. Divide decimal numbers.
______14. Use a decimal equivalent chart.
______15. Convert fractions and percentages.
______16. Solve percentage problems.
______17. Compute discounts and sales prices.
______18. Use an English-Metric conversion chart.
______19. ______________________________

______Written Test Score

Unit 6: Automotive Parts and Systems Identification

______ 1. Analyze situations to determine correct motor oil selection.
______ 2. Analyze situations to determine possible engine problems.
______ 3. Analyze situations to determine possible cooling/heating system problems.
______ 4. Analyze situations to determine exhaust system problems.
______ 5. Analyze situations to determine battery and charging system problems.
______ 6. Answer questions related to brake systems.
______ 7. ______________________________

______Written Test Score

Competency Profile (Cont.)

Unit 7: Small Engine Parts and Systems

______ 1. Solve problems related to the operation and maintenance of small engines.
______ 2. ____

______Written Test Score

Unit 8: Tools and Fasteners

______ 1. Measure bolts and threads.
______ 2. ____

______Written Test Score

Unit 9: Measuring

______ 1. Read U.S. customary and metric rules.
______ 2. Draw lines to specified lengths.
______ 3. Measure lines using a steel rule.
______ 4. Measure lines on objects.
______ 5. Measure the diameter of a circle.
______ 6. Read standard and metric micrometers.
______ 7. Use inside and outside micrometers.
______ 8. Use a dial caliper.
______ 9. Use telescoping gauges.
______10. Use a dial indicator.
______11. ____

______Written Test Score

Unit 10: Stocking, Shipping, and Receiving

______ 1. Arrange a parts bin.
______ 2. Check in and stock parts.
______ 3. Fill and pack an order.
______ 4. ____

______Written Test Score

Unit 11: Inventory Control

______ 1. Fill out an inventory control card.
______ 2. Take a physical inventory.
______ 3. ____

______Written Test Score

Competency Profile (Cont.)

Unit 12: Cataloging and Pricing

______ 1. Use an engine parts catalog.
______ 2. Use a master gasket catalog.
______ 3. Use a brake parts catalog.
______ 4. Use an exhaust system catalog.
______ 5. Use a chassis parts catalog.
______ 6. Use a computer parts catalog.
______ 7. Set up a catalog indexing system.
______ 8. ____

______Written Test Score

Unit 13: Sales Policies and Procedures

______ 1. Count change.
______ 2. Complete a sales ticket.
______ 3. Accept checks.
______ 4. Complete a credit memo.
______ 5. Process a credit card sale.
______ 6. Make a refund.
______ 7. Send and verify receipt of a FAX message.
______ 8. ____

______Written Test Score

Unit 14: Sales Promotion

______ 1. Plan a display.
______ 2. Solve problems concerning sales promotion.
______ 3. Construct a display.
______ 4. ____

______Written Test Score

COMMENTS: ____

____

____

____

Evaluator: ______________________________ Date: ____________________

* Permission to duplicate this profile is granted.

Parts Specialist

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 1: The Parts Specialist

1. Terms and definitions
2. Responsibilities of a parts specialist and their related duties
3. Areas of job opportunities for parts specialists
4. Typical career ladder for those trained as parts specialists
5. Methods of compensation that may be available to parts specialists
6. Fringe benefits frequently available to parts specialists
7. Working conditions of a parts specialist
8. Personal attributes of a good employee and their significance
9. Interview a parts specialist
10. Write a report about parts specialist as a career

Unit 2: Human Relations

1. Terms and definitions
2. Reasons why we study personality
3. Steps for improving your personality
4. Characteristics of a good personality
5. Characteristics of a good fellow worker
6. Undesirable personality traits and their meanings
7. Reasons why people work

Instructional/Task Analysis (Cont.)

Unit 2: (Cont.)

Related Information: What the Student Should Know

8. Ways people are different
9. Ways for getting along with people
10. Ways to get along with the public
11. Expectations of an employer
12. Expectations of an employee

Application: What the Student Should Be Able to Do

13. Conduct a personality survey of a salesperson at work
14. Determine how behavior affects job performance
15. Apply human relations skills in work-related situations

Unit 3: Work Communication Skills

1. Terms and definitions
2. Purposes of communication
3. Essential elements of effective communication
4. Common barriers to effective communication
5. Factors necessary for communicating product information
6. Examples of positive and negative body language
7. Guidelines for effective listening
8. Guidelines for following verbal and written directions
9. Guidelines for improving verbal communication
10. Guidelines for improving written communication
11. Guidelines for giving verbal and written directions

Instructional/Task Analysis (Cont.)

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do
Unit 3: (Cont.)	
12. Guidelines for using the telephone correctly	17. Identify your listening behaviors
13. Procedure for handling interruptions with telephone customers	18. Follow verbal directions
	19. Follow written directions
14. Items of information needed to complete a telephone order	20. Give verbal directions while demonstrating a task
15. Ways to use the telephone as a sales and advertising tool	21. Take a telephone order
16. Tips for intelligent telephone use	
Unit 4: Basic Workplace Safety and First-Aid Skills	
1. Terms and definitions	
2. Rules for personal safety	
3. Guidelines for maintaining a safe work environment	
4. Guidelines for lifting and moving items safely	
5. Rules for using ladders safely	
6. Rules for hazardous materials safety	
7. Purposes of materials safety data sheets	
8. Ways hazardous materials can enter the body	
9. Classes of fires	
10. Types of fire extinguishers	
11. OSHA regulations for battery safety	
12. General rules of battery safety	

Instructional/Task Analysis (Cont.)

Unit 4: (Cont.)

Related Information: What the Student Should Know

13. Battery hazards and ways to avoid them
14. Personal safety rules for working with batteries
15. First-aid procedures for personal acid splashes
16. Emergency procedures for acid-spills on floors and equipment
17. First-aid procedures for cuts and scrapes
18. Safety rules concerning flammable liquids
19. Housekeeping procedures for warehouses and stock rooms
20. Housekeeping procedures for counter and display areas

Application: What the Student Should Be Able to Do

21. Complete a safety inspection
22. Interpret material safety data sheets
23. Analyze scenarios to determine appropriate safety practices
24. Lift a heavy object properly
25. Place and climb a ladder safely

Unit 5: Applied Math for Parts Specialists

1. Terms and definitions
2. Symbols used in math problems
3. Place values of a whole number
4. Adding whole numbers
5. Subtracting whole numbers
6. Multiplying whole numbers
7. Dividing whole numbers
8. Distinguishing among types of fractions

Instructional/Task Analysis (Cont.)

Unit 5: (Cont.)

Related Information: What the Student Should Know

9. Reducing fractions to lowest terms
10. Converting mixed numbers and improper fractions
11. Adding fractions
12. Subtracting fractions
13. Multiplying fractions
14. Place values of decimal numbers
15. Adding decimal numbers
16. Subtract decimal numbers
17. Multiplying decimal numbers
18. Dividing decimal numbers
19. Methods of expressing fractions and decimal equivalents
20. Purposes of a decimal equivalent chart
21. How to use a decimal equivalent chart
22. Converting fractions and percentages
23. Solving percentage problems
24. How to compute discounts and sales prices
25. Values of prefixes associated with metric measurement
26. How to use an English-Metric conversion chart

Application: What the Student Should Be Able to Do

27. Add whole numbers
28. Subtract whole numbers
29. Multiply whole numbers
30. Divide whole numbers
31. Reduce fractions to lowest terms
32. Convert fractions and mixed numbers
33. Add fractions
34. Subtract fractions
35. Multiply fractions
36. Add decimal numbers
37. Subtract decimal numbers
38. Multiply decimal numbers
39. Divide decimal numbers
40. Use a decimal equivalent chart
41. Convert fractions and percentages
42. Solve percentage problems
43. Compute discounts and sale prices
44. Use the English-Metric conversion chart

Instructional/Task Analysis (Cont.)

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 6: Automotive Parts and Systems Identification

1. Basic systems of an automobile
2. Basic components of an automobile engine
3. Components of a typical carbureted fuel system
4. Components of a typical fuel-injected fuel system
5. Components of a typical cooling system
6. Components of a typical heating system
7. Components of a typical air conditioning system
8. Components of a conventional ignition system
9. Components of an electronic ignition system
10. Components of a typical starting system
11. Components of a typical charging system
12. Components of a typical exhaust system
13. Components of a typical emission control system
14. Components of a conventional two-wheel drive
15. Components of a typical four-wheel drive train

Instructional/Task Analysis (Cont.)

Unit 6: (Cont.)

Related Information: What the Student Should Know

16. Components of a typical front-wheel drive train
17. Components of a typical rear-wheel drive train
18. Components of a MacPherson strut suspension system
19. Components of a conventional steering system
20. Components of a power steering system
21. Components of a typical rack and pinion steering system
22. Components of a disc brake system
23. Components of a body system

Application: What the Student Should Be Able to Do

24. Analyze situations to determine correct motor oil selection
25. Analyze situations to determine possible engine problems
26. Analyze situations to determine possible cooling/heating system problems
27. Analyze situations to determine exhaust system problems
28. Analyze situations to determine battery and charging system problems
29. Answer questions related to brake systems

Unit 7: Small Engine Parts and Systems

1. Terms and definitions
2. Operation of a four-stroke cycle engine
3. Parts of a typical four-stroke cycle engine
4. Operation of a two-stroke cycle engine
5. Parts of a typical two-stroke cycle engine
6. Types of fuel systems found on small engines

Instructional/Task Analysis (Cont.)

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 7: (Cont.)

7. Basic components of a typical small engine fuel system and their functions
8. Maintenance requirements for fuel systems
9. Types of cooling systems found on small engines
10. Maintenance requirements for cooling systems
11. Types of ignition systems found on small engines
12. Components of a typical magneto ignition system
13. Components of a typical battery ignition system
14. Maintenance requirements for ignition systems

15. Solve problems related to the operation and maintenance of small engines

Unit 8: Tools and Fasteners

1. Terms and definitions
2. Basic tools that are commonly sold in parts stores
3. Service tools that are commonly sold in parts stores
4. Types of fasteners used in automotive and small engine repair
5. Bolt and thread dimensions and their measurement techniques
6. Procedure used in filling a battery with electrolyte

7. Measure bolts and threads

Instructional/Task Analysis (Cont.)

Unit 9: Measuring

Related Information: What the Student Should Know

1. Terms and definitions
2. Basic units of measure found on rules
3. Types of rules used by a parts specialist
4. Guidelines for using rules
5. Parts of an outside micrometer
6. How to select the proper size outside micrometer
7. Methods for checking accuracy of an outside micrometer
8. Parts of an inside micrometer
9. Uses of an inside micrometer
10. Accessories used with an inside micrometer
11. Methods for checking accuracy of an inside micrometer
12. Rules for use and care of micrometers
13. Parts of a dial caliper
14. Guidelines for care of dial calipers
15. Parts of a torque wrench
16. Basic types of feeler gauges

Application: What the Student Should Be Able to Do

17. Read U.S. customary and metric rules
18. Draw lines to specified lengths
19. Measure lines using a steel rule
20. Measure lines on objects
21. Measure the diameter of a circle
22. Read standard and metric micrometers
23. Use inside and outside micrometers
24. Use a dial caliper
25. Use telescoping gauges
26. Use a dial indicator

Instructional/Task Analysis (Cont.)

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 10: Stocking, Shipping, and Receiving

1. Terms and definitions
2. Organization of parts bins
3. Forms of transportation used in shipping parts
4. Forms used in shipping parts
5. Methods of payment used in shipping and receiving parts
6. Procedure for receiving shipments
7. Steps for filling and packing an order
8. Arrange a parts bin
9. Check in and stock parts
10. Fill and pack an order

Unit 11: Inventory Control

1. Terms and definitions
2. Needs fulfilled by good inventory control
3. Purposes for taking inventory
4. Items included on inventory cards and their purposes
5. Guidelines for taking a physical inventory
6. Perpetual and physical inventories
7. Advantages of computers in inventory control
8. National coding system for popularity of parts
9. Regional coding systems for popularity of parts
10. Fill out an inventory control card
11. Take a physical inventory

Instructional/Task Analysis (Cont.)

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 12: Cataloging and Pricing

1. Terms and definitions
2. Major catalog indexing systems
3. Types of information found in catalogs
4. Basic steps for looking up a part in a published catalog
5. Basic steps for looking up a part in a computer catalog
6. How to price parts correctly
7. Microfiche system and how to use it
8. Use an engine parts catalog
9. Use a master gasket catalog
10. Use a brake parts catalog
11. Use an exhaust system catalog
12. Use a chassis parts catalog
13. Use a computer parts catalog
14. Setup a catalog indexing system

Unit 13: Sales Policies and Procedures

1. Terms and definitions
2. Pricing terms
3. Machines commonly used in a parts store
4. Steps in using a tax table
5. Procedures for counting change
6. Information needed to complete a sales ticket or invoice
7. Procedure for accepting checks
8. Procedure for accepting credit cards
9. Special precautions for handling money orders
10. Special precautions for handling travelers checks
11. Handling exchange items and cores
12. Handling defective items
13. Procedure for making a refund
14. Count change
15. Complete a sales ticket
16. Accept checks
17. Complete a credit memo
18. Process a credit card sale
19. Make a refund
20. Send and verify receipt of Fax message

Instructional/Task Analysis (Cont.)

Unit 14: Sales Promotion

Related Information: What the Student Should Know	**Application: What the Student Should Be Able to Do**
1. Terms and definitions	18. Plan a display
2. Traits of a successful salesperson	19. Solve problems concerning sales promotion
3. Basic steps in selling	20. Construct a display
4. Procedure for waiting on customers	
5. Important sales promotion tools	
6. Types of displays	
7. Purposes of displays	
8. Advantages of displays	
9. Basic display arrangements	
10. Elements of good display design	
11. Common display materials	
12. Uses of colors in displays	
13. Placements of interior displays	
14. Procedure for planning and creating a display	
15. Guidelines for setting up interior displays	
16. Major advertising media advantages/disadvantages	
17. Factors to consider in selecting advertising media	

Related Academic and Workplace Skills
For *Parts Specialist*

Task	Skill Group	Sub Skill	Description
Unit 1: The Parts Specialist			
Interview a parts specialist (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Writing	Writes appropriate entries; writes/prints legibly
	Communication Skills	Listening	Listens for content
		Oral communication	Asks questions to obtain information; communicates a thought, idea or fact in spoken form
Write a report on the parts specialist as a career (A.S. 2)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas
		Writing	Presents own opinion in written form in a clear and concise manner; applies rules of grammar, punctuation, capitalization, and spelling; writes/prints legibly
	Communication Skills	Listening	Listens for content
		Oral communication	Asks questions to clarify information
	Learning Skills	Learning to learn	Processes new information
	Adaptability Skills	Creative thinking	Forms opinions
	Personal Management Skills	Personal and career development	Evaluates career opportunities
Unit 2: Human Relations			
Conduct a personality survey of a salesperson at work (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Writing	Writes appropriate entries; writes/prints legibly
	Communication Skills	Listening	Listens for emotional meaning; interprets nonverbal cues such as eye contact, posture, and questions
	Adaptability Skills	Problem solving	Draws conclusions from observations and evaluates conditions

Academic and Workplace Skills (Cont.)

Unit 2: (Cont.)

Determine how behavior affects job performance (A.S. 2)	Foundation Skills	Reading	Follows written directions; draws conclusions from what is read
		Writing	Presents own opinion in clear, concise manner; writes/prints legibly
	Adaptability Skills	Problem solving	Demonstrates logical reasoning in reaching a conclusion
	Group Effectiveness Skills	Interpersonal relations	Applies human relations skills to real-life situations

Unit 3: Work Communication Skills

Identify your listening behaviors (A.S. 1)	Foundation Skills	Reading	Follows written directions; comprehends written information
	Personal Management Skills	Personal development	Analyzes own behavior to improve personal skills
Follow verbal directions (A.S. 2)	Foundation Skills	Reading	Follows written directions
		Writing	Records data through listening
	Communication Skills	Listening	Listening for content
	Personal Management Skills	Personal development	Analyzes own behavior to improve personal skills
Follow written directions (A.S. 3)	Foundation Skills	Reading	Follows written directions; comprehends written information
	Personal Management Skills	Personal development	Identifies training needs to improve personal skills
Give verbal directions while demonstrating a task (A.S. 4)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to a specific task
	Communication Skills	Listening	Listens for content
		Oral communication	Applies/uses technical terms as appropriate to audience; communicates a thought, idea, or fact in spoken form; speaks effectively using appropriate eye contact, gestures, and posture; speaks in a clear, concise manner; uses proper voice inflection
	Adaptability Skills	Creative thinking	Prepares presentation based on subject knowledge/research

Academic and Workplace Skills (Cont.)

Unit 3: (Cont.)

Take a telephone order (A.S. 5)	Foundation Skills	Reading	Follows written directions; reads back written information
		Writing	Records information from phone conversation; writes/prints legibly
	Communication Skills	Listening	Listens for content
		Oral communication	Asks questions to clarify information; asks questions to obtain information

Unit 4: Basic Workplace Safety and First-Aid

Complete a safety inspection (A.S. 1)	Foundation Skills	Reading	Follows written directions; analyzes and applies what has been read to specific task
	Adaptability Skills	Problem solving	Draws conclusions from observations and evaluates conditions and gives possible solutions
Interpret material safety data sheets (A.S. 2)	Foundation Skills	Reading	Follows written directions; applies/understands technical words that pertain to subject; interprets written information
		Writing	Presents answers/conclusions in a clear and understandable form
Analyze scenarios to determine appropriate safety practices (A.S. 3)	Foundation Skills	Reading	Follows written directions; recalls important details from written information; applies information to new situations
		Writing	Presents answers in a clear, concise manner
	Adaptability Skills	Problem solving	Recognizes problem and takes corrective action
Lift a heavy object properly (J.S. 1)	Foundation Skills	Reading	Follows written directions; applies information to job performance
Place and climb a ladder safely (J.S. 2)	Foundation Skills	Reading	Follows written directions; applies information to job performance

Unit 5: Applied Math for Parts Specialist

Add whole numbers (A.S. 1)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies addition to values in a sequence; solves word problems using addition

Academic and Workplace Skills (Cont.)

Unit 5: (Cont.)

Subtract whole numbers (A.S. 2)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies subtraction to values in a sequence; solves word problems using subtraction
Multiply whole numbers (A.S. 3)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies multiplication to values in a sequence; solves word problems using multiplication
Divide whole numbers (A.S. 4)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies multiplication and division to find answers and to solve word problems
Reduce fractions to lowest terms (A.S. 5)	Foundation Skills	Reading	Follows written directions
		Math	Uses division skills to reduce fractions
Convert fractions and mixed numbers (A.S. 6)	Foundation Skills	Reading	Follows written directions
		Math	Converts fractions/mixed numbers; applies computation skills—addition, subtraction, multiplication, and division
Add fractions (A.S. 7)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Converts fractions/mixed numbers; applies computation skills—addition, subtraction, multiplication, and division; solves word problems using computational skills
Subtract fractions (A.S. 8)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies computation skills; solves word problems using subtraction
Multiply fractions (A.S. 9)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies computation skills—multiplication and division

Academic and Workplace Skills (Cont.)

Unit 5: (Cont.)

Add decimal numbers (A.S. 10)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies addition to decimal values in a sequence; solves word problems using addition
Subtract decimal numbers (A.S. 11)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies subtraction to decimal values in a sequence; solves world problems using subtraction
Multiply decimal numbers (A.S. 12)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies multiplication to decimal values; solves word problems using multiplication
Divide decimal numbers (A.S. 13)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies division to decimal values; solves word problems using division
Use a decimal equivalent chart (A.S. 14)	Foundation Skills	Reading	Uses chart to obtain specific information; follows written directions
		Math	Interprets a chart to determine decimal and fractional equivalents
Convert fractions and percentages (A.S. 15)	Foundation Skills	Reading	Follows written directions
		Math	Converts fractions/percentages
Solve percentage problems (A.S. 16)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies computation skills—addition, subtraction, multiplication, and division to solve word problems
Compute discounts and sale prices (A.S. 17)	Foundation Skills	Reading	Draws conclusions from what is read; follows written directions
		Math	Applies computation skills—addition, subtraction, multiplication, and division to solve word problems

Unit 5: (Cont.)

Use the English-Metric conversion chart (A.S. 18)	Foundation Skills	Reading	Uses chart to obtain specific information; follows written directions
		Math	Applies computation skills—addition and multiplication to solve word problems

Unit 6: Automotive Parts and Systems Identification

Analyze situations to determine correct motor oil selection (A.S. 1)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace
Analyze situations to determine possible engine problems (A.S. 2)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace
Analyze situations to determine possible cooling/heating system problems (A.S. 3)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace
Analyze situations to determine exhaust system problems (A.S. 4)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace
Analyze situations to determine battery and charging system problems (A.S. 5)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace

Academic and Workplace Skills (Cont.)

Unit 6: (Cont.)

Answer questions related to brake systems (A.S. 6)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace

Unit 7: Small Engine Parts and Systems

Solve problems related to the operation and maintenance of small engines (A.S. 1)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related situations
	Learning Skills	Learning to learn	Processes new information as related to workplace

Unit 8: Tools and Fasteners

Measure bolts and threads (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Math	Makes precision measurements using a steel rule

Unit 9: Measuring

Read U.S. customary and metric rules (A.S. 1)	Foundation Skills	Reading	Follows written directions
		Math	Makes precision measurements using a steel rule
Draw lines to specified lengths (A.S. 2)	Foundation Skills	Reading	Follows written directions
		Math	Draws lines to specification using a steel rule
Measure lines using a steel rule (A.S. 3)	Foundation Skills	Reading	Follows written directions
		Math	Makes rough and precision measurements using a steel rule; measures in metric units; reduces fractions to lowest terms
Measure lines on objects (A.S. 4)	Foundation Skills	Reading	Follows written direction
		Math	Makes precision measurements using a steel rule; reduces fractions to lowest terms

Academic and Workplace Skills (Cont.)

Unit 9: (Cont.)

Measure the diameter of a circle (A.S. 5)	Foundation Skills	Reading	Follows written directions
		Math	Makes precision measurements using a steel rule: reduces fractions to lowest terms
Read standard and metric micrometers (A.S. 6)	Foundation Skills	Reading	Follows written directions; comprehends written information for main ideas; analyzes and applies what has been read to work-related tasks
	Learning Skills	Learning to learn	Processes new information as related to workplace
		Math	Makes standard and metric measurement readings
Use inside and outside micrometers (J.S. 1)	Foundation Skills	Reading	Follows written directions; reads and follows instructions to operate precision instruments
		Math	Makes precision measurements
Use a dial caliper (J.S. 2)	Foundation Skills	Reading	Follows written directions; reads and follows instructions to operate precision instruments
		Math	Makes precision measurements
Use telescoping gauges (J.S. 3)	Foundation Skills	Reading	Follows written directions; reads and follows instructions to operate precision instruments
		Math	Makes precision measurements
Use a dial indicator (J.S. 4)	Foundation Skills	Reading	Follows written directions; applies what has been read to a specific task
		Math	Makes precision measurements; measures in metric units

Unit 10: Stocking, Shipping, and Receiving

Arrange a parts bin (J.S. 1)	Foundation Skills	Reading	Follows written directions; applies information to job performance
Check in and stock parts (J.S. 2)	Foundation Skills	Reading	Follows written directions; applies information to job performance; uses appropriate materials and techniques as specified

Academic and Workplace Skills (Cont.)

Unit 10: (Cont.)

Fill and pack an order (J.S. 3)	Foundation Skills	Reading	Follows written directions; applies information to job performance
		Writing	Completes form accurately—invoice

Unit 11: Inventory Control

Fill out an inventory control card (A.S. 1)	Foundation Skills	Reading	Follows written directions; applies information to job performance
		Writing	Completes form accurately; writes/prints legibly
	Learning Skills	Learning to learn	Processes new information as related to workplace
Take a physical inventory (J.S. 1)	Foundation Skills	Reading	Follows written directions; uses appropriate materials and techniques as specified
		Writing	Completes form accurately; writes/prints legibly
		Math	Adds and multiplies to prepare an inventory sheet

Unit 12: Cataloging and Pricing

Use an engine parts catalog (A.S. 1)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; understands technical words that pertain to subject
		Writing	Records numerical data; writes/prints legibly
		Math	Adds and multiplies to determine totals
Use a master gasket catalog (A.S. 2)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; understands technical words that pertain to subject
		Writing	Records numerical data; writes/prints legibly

Academic and Workplace Skills (Cont.)

Unit 12: (Cont.)

Use a brake parts catalog (A.S. 3)	Foundation Skills	Reading	Follows written directions; uses resources to obtain factual information; understands technical words that pertain to subject
		Writing	Records numerical data; writes/prints legibly
		Math	Adds and multiplies to determine totals
Use an exhaust system catalog (A.S. 4)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; understands technical words that pertain to subject
		Writing	Records numerical data; writes/prints legibly
Use a chassis parts catalog (A.S. 5)	Foundation Skills	Reading	Follows written directions; uses written resources to obtain factual information; understands technical words that pertain to subject
		Writing	Records numerical data; writes/prints legibly
Use a computer parts catalog (A.S. 6)	Foundation Skills	Reading	Follows written directions; uses standard occupational resource materials; understands technical words that pertain to subject
		Writing	Records data from resource material; writes/prints legibly
Set up a catalog indexing system (J.S. 1)	Foundation Skills	Reading	Analyzes and applies what has been read to specific task
	Influence Skills	Organizational effectiveness	Applies knowledge to implement work-related system

Unit 13: Sales Policies and Procedures

Count change (A.S. 1)	Foundation Skills	Reading	Follows written directions; uses appropriate technique as specified
		Math	Distinguishes between coin/bill denominations; counts money accurately

Academic and Workplace Skills (Cont.)

Unit 13: (Cont.)

Complete a sales ticket (A.S. 2)	Foundation Skills	Reading	Follows written directions; determines what information is needed
		Writing	Records numerical data; completes form accurately; writes/prints legibly
		Math	Calculates dollar amounts using addition and multiplication
Accept checks (A.S. 3)	Foundation Skills	Reading	Follows written directions; adjusts reading strategy to purpose and type of reading; identifies inaccurate entries on written documents
		Writing	Presents answers in a clear and understandable form; writes/prints legibly
Complete a credit memo (A.S. 4)	Foundation Skills	Reading	Follows written directions; adjusts reading strategy to purpose and type of reading
		Writing	Records numerical data; completes form accurately; writes/prints legibly
Process a credit card sale (J.S. 1)	Foundation Skills	Reading	Analyze and apply what has been read to specific task; follows written directions
		Writing	Records numerical data; completes form accurately; writes/prints legibly
	Influence Skills	Organizational effectiveness	Adapts to the organization's mode of operation
Make a refund (J.S. 2)	Foundation Skills	Reading	Analyze and apply what has been read to specific task; follows written directions
	Communication Skills	Oral communication	Speaks effectively using appropriate eye contact, gestures, and posture
		Listening	Listens for content
	Group Effectiveness Skills	Interpersonal relations	Establishes business rapport with customers; applies human relations skills to real-life situations
	Influence Skills	Organizational effectiveness	Adapts to the organization's mode of operation

Academic and Workplace Skills (Cont.)

Unit 13: (Cont.)

Send and verify receipt of a FAX message (J.S. 3)	Foundation Skills	Reading	Reads and follows instructions to operate technical equipment; applies information to job performance

Unit 14: Sales Promotion

Plan a display (A.S. 1)	Foundation Skills	Reading	Follows written directions; applies what has been read to a specific task
		Writing	Writes appropriate entries; writes/prints legibly
	Adaptability Skills	Creative thinking	Creates new design by applying criteria specified in information sheet
Solve problems concerning sales promotion (A.S. 2)	Foundation Skills	Reading	Applies written information to job performance/new situations; draws conclusions from what has been read
		Writing	Writes logical and understandable sentences; writes/prints legibly
	Adaptability Skills	Problem solving	Demonstrates logical reasoning in reaching a conclusion
	Influence Skills	Organizational effectiveness	Applies knowledge to implement work-related system or practice
Construct a display (J.S. 1)	Foundation Skills	Reading	Applies information to job performance; follows written directions
	Adaptability Skills	Problem solving	Evaluates job performance; recognizes problems and implements solutions

Parts Specialist

Tools, Equipment, and Materials List

Address label
Automotive parts
Bolts and threads assortment
Calculator
Cardboard boxes
Cash drawer with assortment of cash/bills
Catalogs and price sheets
Catalog racks
Cleaning cloth (lint free)
Clipboard
Computer catalog software
Counter or table
Credit card
Credit card forms
Credit card machine
Dial caliper (metric or standard)
Dial indicator
Display stands
Dividers
Eye protection
Inside micrometer set with extension rods
Inventory sheet
Invoice
Ladder
Letters and numbers for bin identification
Light machine oil
Merchandise for display
Microfiche reader
Order form
Outside micrometer (metric or standard)
Packing materials
Packing slip
Parts bin
Pencil
Props for displays
Shelves
Small engine parts
Steel rule
String
Tables
Tabs
Tags for numbering or labeling parts
Tape
Tape recorder
Telescoping gauge
Vise or lathe

Parts Specialist

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Parts Specialist

Glossary

Accident — Any suddenly occurring, unintentional event which causes injury or property damage

Accountable — The conduct of business affairs in such a manner that the receipt, storage, and marketing of merchandise can be systematically controlled and recorded

Acronym — Consists of the first letter of each word in a compound term

Active stock — Merchandise that sells quickly

Addition — Process of totaling two or more numbers to find another number called a sum

Example: 3 + 5 + 9 = 17

Advertising — A means of informing potential customers so that they may choose more wisely from a variety of businesses, goods, and services available in their market area

Apple-polishing — Extending attention or service to one in a higher position with the hope of personal gain

Back order — An order for merchandise that is not currently in stock but will be delivered when it becomes available

Bill of lading — A form listing quantity and description of goods, plus shipping instructions, to be used in transferring parts from shipper to transportation company

Bin — Any one of several types of adjustable shelves used to store parts

Body language — Gestures, facial expressions, and posture that convey a message

Body system — Outer shell that provides protected area for auto components, people, luggage, etc.

Bolt — Metal rod or pin for fastening objects together; has a head at one end, a screw thread at the other end, and is secured by a nut

Brake system — Method by which an operator slows or stops a vehicle

Breaker points — A set of electrical contacts which serve as a switch for primary current in both magneto and battery-ignition systems

Call tag — A form requesting a part be picked up at a designated location

Carburetor — A device which uses vacuum produced during an engine's intake stroke to draw fuel and air together and mix them in proper proportions for combustion within the engine

Glossary (Cont.)

Charging system — Recharges the battery and maintains a supply of electrical current to meet the operating needs of the automobile

Cheerfulness — An upbeat, consistent mood that is not affected by drastic swings into depression and self-pity

Clique forming — Getting with the "in" crowd because of peer group pressure or for the sake of personal gain

"Closing a sale" — Asking the customer for the order

Combustible — Capable of being easily ignited and burning quickly at temperatures below 100°F

Commission — A method of payment based on a set percentage of merchandise

Communication — Exchange of information from one person to another through verbal and nonverbal messages

Communication barrier — Something that prevents the receiver from receiving or understanding the message

Confidence — Faith or trust in one's actions and abilities

Cooling system — Keeps the engine at its most efficient operating temperature during all engines speeds and driving conditions

Core — Used item accepted in exchange; it is either remanufactured or reconditioned so it can be resold

Credit memo — A ticket used to give credit or refund to a customer when merchandise is returned

Dealer price — Price charged to other dealers within the system or industry who are authorized to sell to users; usually the first discount below list price

Decimal — Fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

Examples: 0.1 - 1/10   0.06 = 6/100   0.003 = 3/1000

Denominator — Base or lower number of a fraction

Example: The denominator of 3/4 is 4.

Dial caliper — Instrument used to make high-precision measurements; can take both inside and outside measurements of parts and components

Glossary (Cont.)

Dial indicator — Precision instrument designed to measure small amounts of movement; may be graduated in thousandths of an inch or hundredths of a millimeter

Die — Internally threaded screw cutting tool used for forming external screw threads

Digit — Any one of the ten symbols, 0 to 9, by which all numbers can be expressed

Discount — A special reduction made from list price for certain customers; usually those who buy in large quantities and pay promptly

Display — The art of communicating with people visually in order to get their attention so that they will consider the purchase of a product

Display sketch — The blueprint which shows what the display will look like and what is needed for assembly

Division — Opposite operation of multiplication

Example: $16 \div 2 = 8$ as opposed to $8 \times 2 = 16$

Drive train — Delivers the power developed by the engine through clutch or torque converter and transmission to the drive shaft, differential to the wheels for motion

Emergency order — An order placed for special items not regularly stocked

Emission control system — Devices on an automobile to control air pollution

Endorsement — Signature placed on the back of a check by the person cashing it

Engine — A machine that converts fuel into heat energy which produces mechanical force and motion

E.O.M. (End of Month) — Indicates the terms of payment are computed from the end of the month in which the purchase is made

Error — Mistake in the reading or total measurement

Exhaust system — Conducts burned gases away from the engine and passenger compartment through catalytic converter, muffler, and pipes

Exploit — To make unethical use of another person for one's own advantage

Extending prices — Showing the list price, net, or customer's price, the customer's price times the quantity sold, the subtotal of items purchased, tax, and the invoice total

Fast moving parts — Those parts which sell very quickly

Fastener — Device used to secure or hold together separate items

Feel — A sense of touch developed to such a degree that two people can measure a workpiece and arrive at measurements that are exactly the same

FIFO (first in, first out) — A type of perpetual inventory whereby the first items placed in stock are the first ones taken out

First aid — Immediate, temporary care given the victim of an accident or sudden illness until the services of a physician can be obtained

Flag — Methods using small tags attached to inventory control cards to indicate at a glance whether a part is backordered or out of stock

Flammable — Capable of bursting into flames at temperatures below 100°F

Footnote — A note of reference, explanation, or comment placed below the text on a given page; usually indicated by a small number or asterisk

Forcefulness — A strong personality trait that displays self-confidence and one's belief in one's ability; the lack of ambiguity

Four-stroke cycle engine — Internal combustion engine which completes a complete power, exhaust, compression and intake cycle in four piston strokes (or two revolutions of the crankshaft)

Fraction — Part of a whole; represents one or more equal parts of a unit

Free enterprise — The freedom of private business to organize and operate for profit with minimum government regulation

Friendliness — A genuinely open mannerism, lacking defensive gestures or activities

Fuel system — Supplies a combustible mixture of air and fuel to the engine cylinders to meet all driving conditions

Gossiping — Repeating rumors or distorted information about a person, a situation, or an ethnic group

Graduation — Marking found on rules and scales to denote unit of length, diameter, or torque

Grapevine — Unofficial, informal communication system that exists in all organizations; may be helpful or harmful depending on how it is used

Handling charge — A nominal charge for processing an item for return through the normal channels of a manufacturer or supplier

Hard parts — Sometimes called hard lines which include metal parts, power tools, hand tools, paints, electrical products, and various hardware items kept by the parts suppliers

Hazard — Potential source of danger

Glossary (Cont.)

Hazardous materials — Any cancer-causing, corrosive, toxic irritant, sensitizer, or materials that has the potential for damaging effects on specific body organs

HazMat — An abbreviation for "hazardous materials" used in federal safety programs

Honesty — Fairness of conduct

Horizontal shaft engine — An engine in which the crankshaft is mounted in a horizontal position

Ignition system — Provides a high voltage spark to ignite the fuel-air mixture in the combustion chamber

Illustration lists — Contain exploded views of parts, usually by groups

Intermediate order — An order placed after a regular stock order to replenish stock until the regular stock order shipment is received

Inventory — Parts and supplies on hand for sale to customers

Inventory card — Used to keep a running count of items in inventory

Inventory control — Methods of keeping record of the quantity and type of merchandise on hand

Invoice — An itemized list of goods shipped; usually accompanied with a request for payment

Jargon — Specialized vocabulary of those in the same work or profession

Jobber — A wholesaler who sells to dealers, garages, and do-it-yourselfers

Jobber price — Price charged to person reselling to user or other vendor; discounted lower than dealer price

LIFO (last in, first out) — A type of perpetual inventory whereby the newest items placed in stock are the first ones taken out

List price — Suggested sale price of an item to its final user; sometimes referred to as retail price

Listening — Receiving, processing, and evaluating both verbal and nonverbal communication

Liter — Metric unit used to measure capacity

Lost sales — Items requested by customers but not carried in stock

Magneto — A mechanical device which uses moving magnets to induce electrical current in a stationary coil of a transformer, thereby creating a high voltage spark for engine ignition

Mark-up — Difference between cost of an item and retail price

Master parts catalog — Provides a means of determining the correct part number for pricing and ordering purposes

Material Safety Data Sheet (MSDS) — Form that lists and explains each of the hazardous materials that an employee works with so that the employee can safely use the material and respond to emergency situations

Media — The ways to reach people through advertising

Meter — Metric unit used to measure length

Microfiche — A system using microfilm sheets capable of containing numerous pages of information in small segmented blocks and optical equipment capable of enlarging these blocks of information for viewing

Micrometer — Instrument used to measure accurately to 0.001 inch or 0.01 millimeter

Mini/max — A method used in inventory control to maintain a minimum or maximum number of any specific items in stock

Money order — Order issued by various vendors such as a post office, bank, or telegraph office for payment of money

Monitor — Video display screen used with a computer

Multiple pricing — Pricing in terms of quantities of more than one unit

Multiplication — Abbreviated process of adding a number to itself a specified number of times

Example: $6 \times 3 = 18$ as opposed to $6 + 6 + 6 = 18$

Net price — The cost of an item usually determined by the class of the purchaser

Net 30 — The invoice must be paid not later than 30 days from the date of the invoice

Nonverbal communication — Sending/receiving a visual message

Numerator — Top number of a fraction

Example: The numerator of 1/3 is 1.

Occupational Safety and Health Act (OSHA) — Federal legislation designed to ensure safe and sanitary working conditions for employees

Open account — An ongoing account for a customer with good credit who makes frequent purchases and is therefore allowed to charge as needed and pay in one lump sum at the end of each month

Order — A request made by phone or mail for some dealer or parts store to ship goods

Packing slip — An itemized list packed with the parts which lists the articles to be found in the box or package

Paid out — Money spent by the firm; usually used in connection with cash register transactions

Passing the buck — Dodging responsibility or blame by suggesting that persons in higher positions are responsible or should make a decision or answer for a fault

Peer pressure — The psychological need to be accepted by others in one's own age group or by others of one's own social or vocational status

Percent — One part in a hundred; reckoned on the basis of a whole divided into one hundred parts

Perpetual inventory — Record kept of each item showing the amount of merchandise put in stock, withdrawn, and on hand at any given time without the necessity of taking a physical count

Perseverance — To continue in a job or action despite opposition or discouragement

Personality — The sum of all specific traits that are consistently observable in an individual's behavior

Physical inventory — A method used to count items in stock by hand, usually taken at least once a year

Politicking — Exploiting others for personal gain

Post dating — Dating a check for a date later than when the check is written

Posting — Adding to or removing an item or items recorded on inventory cards

Promotion — Coordination of efforts to establish communication with potential customers

Prop — Fixture used to build a display

Proportional — Being relatively equal in size or quantity

Example: 1:1:3 = 0.5:0.5:1.5

Purchase order — A formal request from the buyer to the seller which specifies the conditions of sale and delivery

Quantity discount — A reduction given to encourage customers to buy in large quantities

Quick reference catalog — Published primarily for independent garage and parts persons, and usually lists only fast moving items such as brake parts, mufflers, shock absorbers, spark plugs, and filters

Ratio — Relationship in quantity, amount, or size between two or more things

Reference point — Starting point of measurement for both workpiece and rule

Refund — Money given back to a customer upon return of merchandise or for an overcharge on a sale

Reliable measure — Accurate or true measure

Requisition — A written request authorizing purchase of specific goods; may be referred to as a purchase order

Reserve stock — Merchandise kept in warehouse to replace active stock as it is sold

Safety — State or condition of being safe; freedom from danger, risk, or injury

Sales tax — A certain percent of the total bill

Sales ticket (Invoice) — A ticket which states the date, customer's name, quantity, part number, description, price of items sold, and method of payment

Screw — Pointed and headed cylindrical fastener that is threaded and designed for insertion into material by rotating

Selective hearing — Listening only to certain facts or details and missing the real meaning

Self-confidence — An overall air of knowledge of one's job or position and security with one's self as an important, contributing member of society

Selling — The process of determining the needs and wants of a customer and presenting a product, service, or idea in such a way that a customer is motivated to make a favorable buying decision

Shipping receipt — A form showing quantity, description, weight, and shipping costs of the merchandise being delivered

Slang — Informal, nonstandard vocabulary, often ungrammatical

Soft parts — Usually nonmetal items such as rubber, paper, gaskets, hoses, belts, and other pliable goods

Solid state ignition — An ignition system which uses electronic components such as diodes and transistors, instead of breaker points, to control its primary current

Glossary (Cont.)

Starting system — Converts electrical power from the battery into mechanical energy to crank the engine

Steel rule — Semi-precision instrument graduated in fractional or decimal parts of an inch or metric measure

Steering system — Allows control of direction of the vehicle through a gearbox or rack-and-pinion assembly and linkage connected to the front wheels

Stock order — A purchase order regularly issued by a wholesaler to bring stock up to the desired level

Stock rotation — A method of placing new merchandise behind older merchandise so old items will be sold first

Stud — Steel rod with threads on both ends; is screwed permanently into a fixed part at one end and receives a nut on the exposed end

Subtraction — Opposite operation of addition

Example: $8 - 4 = 4$ as opposed to $4 + 4 = 8$

Suspension system — Mounted to the framework through a series of linkages and springs to allow the wheels to move up and down on rough roads while the rest of the vehicle remains fairly steady

Tactfulness — The ability to deal with co-workers and customers in a polite, kind manner despite the circumstances or the mood of others present

Tap — Tool for forming internal screw threads

Telescoping gauge — Instrument used to measure the internal diameter of parts; range in size from 5/16 inch to 6 inches

Trade discount — A reduction offered to customers who will use a particular item for resale or to make repairs

Trait — A distinguishing quality or characteristic that contributes to personality

Travelers check — Check guaranteed by deposits at bank which issues the check; may be replaced if stolen; has to be signed at bank and again in front of person who cashes it

Turnover — How quickly stock moves and is replaced within a certain period of time

Two-stroke cycle engine — Internal combustion engine which completes a complete power, exhaust, compression and intake cycle in two piston strokes (or one revolution of the crankshaft)

Glossary (Cont.)

Unit inventory — Counts, sorts, or weighs incoming articles to verify receipt of items on requisitions or invoices

Verbal communication — Sending/receiving a written or spoken message

Vertical shaft engine — An engine in which the crankshaft is mounted in a vertical position

Warranty — A guarantee from manufacturer to seller that the product will perform to specifications for a certain use period

Whole number (integer) — Any of the natural numbers, both positive and negative, that represents a complete item

Example: 25 is a whole number as opposed to 3/4, a fraction or part of a whole.

***Permission to duplicate this glossary is granted.**

The Parts Specialist
Unit 1

Objective Sheet

Unit Objective

After completing this unit, the student should be able to discuss the parts specialist career, including job requirements, responsiblities, and benefits. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms associated with a parts specialist to their correct definitions.
2. Discuss in writing the responsibilities of a parts specialist and their related duties.
3. List six areas of job opportunities for parts specialists.
4. Draw a typical career ladder for those trained as parts specialists.
5. Discuss in writing the five methods of compensation that may be available to parts specialists.
6. List the five fringe benefits frequently available to parts specialists.
7. Describe in writing the working conditions of a parts specialist.
8. Match personal attributes of a good employee with their significance.
9. Interview a parts specialist. (Assignment Sheet 1)
10. Write a report about parts specialist as a career. (Assignment Sheet 2)

The Parts Specialist
Unit 1

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Review the suggested supplemental resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Obtain copies of the *Occupational Outlook Handbook Dictionary of Occupational Titles*, and *Guide for Occupational Exploration*.
- Make transparencies from the transparency masters included in this unit.
- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

Suggested Activities

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Teaching Suggestions

Objective 1 Match terms associated with a parts specialist to their correct definitions.

- Read and discuss with students the terms and definitions in this section of the information sheet. Point out and expand on the definitions of each term to help the students learn the precise meanings as they are used in this unit. Conduct class discussion on the term "free enterprise" as it applies to the marketplace encountered by a parts specialist. Also, explain the flow of merchandise (Teacher Supplement 1) in the parts industry to define the term "jobber" and how that individual fits in to the overall business of parts supply. **(Reading/listening for content; applying technical terms)**

Objective 2 Discuss in writing the responsibilities of a parts specialist and their related duties.

- Point out to students that in this unit they will learn about the various responsibilities of a parts specialist and the duties those responsibilities require. Read the descriptions accompanying each item listed in Objective 2 and discuss the general purpose of each in the occupational area. Then read the notes accompanying the items and expand class discussion accordingly. **(Reading/listening for content; applying technical terms; adapting to the organization's goals, values, culture, and traditional modes of operation)**

Objective 3 List six areas of job opportunities for parts specialists.

- Discuss with students the list of nine possible places where job opportunities exist for a parts specialist and seek class discussion about local businesses which fit into each category. **(Reading/listening for content; applying technical terms)**

Suggested Activities

- Invite owners or department managers from as many types of businesses in this list to speak to the class and to answer student's questions about the importance of parts specialists in these businesses. Refer students to Assignment 2 for sample questions. **Listening for content; communicating thoughts and ideas in oral and written form in a clear, concise manner)**

Objective 4 Draw a typical career ladder for those trained as parts specialists.

- Review with the class the typical career ladder included in this portion of the information sheet (Transparency 1) and discuss the various levels and the need for competency in each before moving on to the next level. **(Listening for content; developing the ability to apply knowledge to other situations)**

- Based on information gleaned from classroom interviews and the completion of Assignment Sheet 1, lead a class discussion on the various levels of the career ladder and what responsibilities and benefits each would involve. **(Comprehending and analyzing written and oral information)**

- Suggest that students consider writing down their career goals and listing the educational and experience requirements they will need to move upward through the ladder. **(Developing ability to apply knowledge to other situations)**

Objective 5 Discuss in writing the five methods of compensation for those trained as parts specialists.

- Review and discuss with the class the different methods of determining compensation for those trained as parts specialists. Point out the differences in incentive each method has for the employee, and ask the students to discuss why an employer might prefer one method over another. Lead the class in a discussion of which method would be of most interest to class members present. **(Listening for content; developing the ability to apply knowledge to other situations)**

Suggested Activities

Objective 6 List five fringe benefits frequently available to parts specialists.

- Review and discuss with the class the various fringe benefits many parts specialists receive from their employers. Discuss the importance of each, and point out how the cost of such benefits must be included in figuring one's total income when comparing different jobs. Prepare examples to give to the class explaining the overall cost to an employee of a minimum health insurance policy as compared to purchasing that same policy as an individual. Explain how profit sharing works and lead the class in a discussion about the incentives such a policy offers to employees. **(Listening for content; developing the ability to apply knowledge to other situations)**

Objective 7 Describe in writing the working conditions of a parts specialist.

- Lead the class members in a discussion of the working conditions listed in this objective, based on what they learned during their class interviews of parts specialists and managers from local businesses. Ask class members what benefits such working conditions might have over more physical, outdoor type jobs. **(Listening for content; developing the ability to apply knowledge to other situations; comprehending and analyzing oral and written information)**

Objective 8 Match personal attributes of a good employee with their significance.

- Discuss the various attributes given in this portion of the information sheet (Transparency 2), explaining that the ability to work with people is of prime importance in any job, particularly one that deals with the public as much as that of a parts specialist. Point out the benefits of being a self-disciplined employee and the overall importance of honesty and integrity in any job. Based on the list of attributes, ask class members to cite poor examples of treatment they have received from employees of businesses, and discuss how they felt after such treatment. **(Listening for content; developing the ability to apply knowledge to other situations; comprehending and analyzing oral and written information)**

Suggested Activities

Assignment Sheet 1 Interview a parts specialist.

- Have students locate Assignment Sheet 1. Read with students the introduction and directions to the exercise. Discuss the various questions included as part of the interview. Assist students in securing interviews with parts specialists in the community. **(Reading/listening for content; comprehending and analyzing oral and written information; communicating thoughts and ideas in oral and written form in a clear, concise manner)**

Assignment Sheet 2 Write a report about parts specialist as a career.

- Review what you have discussed in class concerning the parts specialist and discuss the information provided by classroom visitors from the parts industry.
- Have students locate Assignment Sheet 2 and write a report on what they have learned concerning the main features of a career as a parts specialist. **(Reading/listening for content; developing the ability to apply knowledge to other situations; comprehending and analyzing oral and written information; communicating thoughts and ideas in written form in clear, concise manner)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.
- Give and evaluate written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores. See the teacher page "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Auto Parts Clerk.* Tallahassee, FL: Division of Vocational Education, Florida Department of Education.
- *Briggs & Stratton, Largest Air Cooled Engine Builder in the World*, Milwaukee, WI: Briggs & Stratton Corp. 1993.

Suggested Activities

- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management.* New York, NY: Delmar Publishers, Inc., 1989.
- Notgrass, Troy. *Auto Partsman, Coordinator's Guide.* Austin, TX: Instructional Materials Center, University of Texas.

Suggested Supplemental Resources

- Briggs & Stratton Corp., Education Dept., P.O. Box 702, Milwaukee, WI 53210.
- NAPA Training Programs, NAPA VideoSource (Helm, Inc.) P.O. Box 5450/Dept. N, Detroit, MI 48202-9953. Or, call toll-free 1-800-882-6272. Printed and video training information for Delivery Driver, Inside Sales, Outside Sales, Store Management, and Dealer Training.
- Notgrass, Troy. *Automotive Parts Clerk.* Austin, TX: Instructional Materials Center, University of Texas, 1986.

The Parts Specialist
Unit 1

Answers to Assignment Sheets

Assignment Sheet 1—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2—Student performance should be evaluated according to the criteria listed on the assignment sheet. Content of written report should be based on classroom discussions and visits with industry representatives.

The Parts Specialist
Unit 1

Answers to Written Test

1. a. 3
   b. 4
   c. 1
   d. 5
   e. 2

2. Discussion should include reference to the following:

   Receiving — Receives, stores and issues equipment, materials, supplies, merchandise, or tools in an accountable manner

   Recording — Compiles stock records in a stockroom or warehouse

   Unit inventory — Counts, sorts, or weighs incoming articles to verify receipt of items on requisitions or invoices

   Inspection — Examines stock to verify it conforms to specifications, and lists shortages

   Storage — Places articles in bins, on shelves, or in floor areas according to identifying information such as style, size, or type

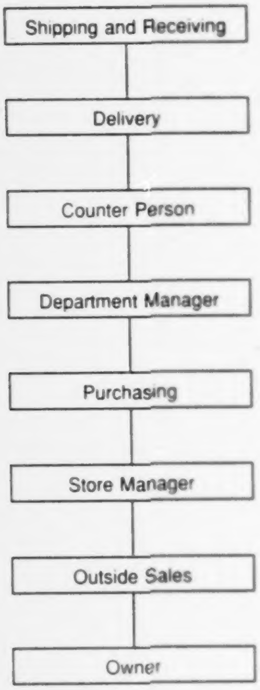
   Counter work — Fills orders or issues supplies from stock; may include inside sales and waiting on customers

   Inventory control — Compiles reports of adjustments of inventory counts and stock records related to stock damage, refused shipments, merchandise returns, and material location changes.

3. List should contain five of the following: Automotive dealers, automotive parts and supply stores, heavy equipment dealers, implement dealers, jobbers, marine dealers, small engine and outdoor equipment dealers, mass merchandisers, and motorcycle dealers

Answers to Written Test

4.


Shipping and Receiving
Delivery
Counter Person
Department Manager
Purchasing
Store Manager
Outside Sales
Owner

5. Discussion should include reference to the following in a manner indicating understanding of the subject:

Hourly — Based on total number of hours worked in a given pay period

Weekly — A set sum or salary agreed upon for a week's normal working hours

Monthly — A set sum or salary agreed upon for a month's normal working hours

Commission — A method of payment based on a set percentage of merchandise sold

Combination of salary and commission — A method of payment which involves paying the employees a small but guaranteed salary with the incentive to sell merchandise for a percentage of the total sale.

Answers to Written Test

6. List should include the following in any order:

   a. Employee discounts
   b. Hospitalization and accident insurance
   c. Paid vacation
   d. Profit sharing
   e. Uniforms

7. Description should include reference to clean, comfortable surroundings and contact with public either in person or by telephone.

8. a. 10
   b. 8
   c. 1
   d. 9
   e. 2
   f. 4
   g. 5
   h. 6
   i. 3
   j. 11
   k. 7

The Parts Specialist
Unit 1

Written Test

Name ______________________________ Score ______________

1. Match terms associated with a parts specialist to their correct definitions. Write the numbers on the blanks.

   ______a. An itemized list of goods shipped; usually accompanied with a request for payment

   ______b. A wholesaler who sells to dealers, garages, and do-it-yourselfers

   ______c. The conduct of business affairs in such a manner that the receipt, storage and marketing of merchandise can be systematically controlled and recorded

   ______d. A written request authorizing purchase of specific goods; may be referred to as a purchase order

   ______e. The freedom of private business to organize and operate for a profit with minimum government regulation

   1. Accountable
   2. Free enterprise
   3. Invoice
   4. Jobber
   5. Requisition

2. Discuss in writing the responsibilities of a parts specialist and their related duties.

Written Test

3. List six areas of job opportunities for parts specialists.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

   e. ______________________________

   f. ______________________________

4. Draw a typical career ladder for those trained as parts specialists.

Written Test

5. Discuss in writing the five methods of compensation that may be available to parts specialists.

____

____

____

____

____

____

6. List the five fringe benefits frequently available to parts specialists.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

7. Describe in writing the working conditions of a parts specialist.

____

____

____

____

____

____

____

Written Test

8. Match personal attributes of a good employee with their significance. Write the numbers on the blanks.

______a. Possess the ability to make one's self perform the necessary tasks at times when it is tempting to do otherwise.

______b. Employees should give truthful information both to customers and their employer.

______c. Possess a positive attitude and control one's temper.

______d. Be conscious of waste in materials and time.

______e. Look for unsafe conditions that could injure workers or customers or damage property; also, continually seek more efficient methods of doing one's job.

______f. Follow safety regulations and develop safe working habits.

______g. Develop good work habits which include regular attendance and being on time.

______h. Do things on your own initiative; don't wait to be told.

______i. Pay particular attention to the details of one's job to ensure overall successful accomplishment.

______j. Good employees always look for ways to increase their knowledge; this benefits both the employee and the employer.

______k. Take pride in your work and be willing to do more than your share when needed.

1. Ability to work with others
2. Alertness, quickness of mind
3. Attention to detail
4. Safety conscious
5. Dedication and dependability
6. Desire to work
7. Enthusiasm and interest
8. Honesty and integrity
9. Put in a day's work for a day's pay
10. Self-discipline
11. Desire to improve one's self

*Permission to duplicate this test is granted.

The Parts Specialist
Unit 1

Unit Evaluation Form

Student Name ______________________________ Unit Rating ________

Assignment Sheet 1—Interview a Parts Specialist Rating _____

Comments: ____

____

Assignment Sheet 2—Write a Report on the Parts Specialist as a Career Rating _____

Comments: ____

____

Written-Test Scores

Pretest _____ Posttest _____ Other _____

Other ____

____

Teacher Signature ______________________________ Date ________

Student Signature ______________________________ Date ________

*Permission to duplicate this form is granted.**

The Parts Specialist
Unit 1

Teacher Supplement 1—Where a Parts Specialist Fits in a $30 Billion Industry

With nearly 182 million cars, trucks, and busses registered in the U.S. each year, driven a total of a trillion miles per year, auto supplies and parts are in constant demand. And, when you add in several hundred million small air-cooled engines powering lawn and garden equipment, generators, motorcycles, power boats, and a host of other labor-saving devices, the total number of parts, accessories, and consumables in demand each year is staggering. In all, it amounts to a $30 billion annual business for wholesalers alone.

Everyday use of vehicles and other engine-powered equipment is responsible for the need for spark plugs, batteries, windshield wipers, ignition parts, brake systems, air cleaners and other filters, steering and suspension parts, belts, hoses, fuel and lubricants, and hundreds of other parts so readily available most can be in the customer's hands no later than 24 hours after they are ordered. In most cases, parts are available on a "cash-and-carry" basis at thousands of wholesale and retail outlets.

This complex, but efficient, system begins with vehicle and small engine manufacturers, who along with independent parts makers, sell parts through about 1,000 warehouse distributors throughout the U.S. These distributors serve as large distribution centers which supply auto and engine parts to about 28,000 wholesalers (or jobbers). Jobbers sell about 55 to 60 percent of their merchandise to fleet operators, and independent garages and service stations. The remainder is sold to "walk-in" customers who range from independent mechanics to the do-it-yourselfer working on his or her own vehicle or small engine.

Given the number of jobbers in the U.S., and the number of manufacturer-owned outlets for boat motors, lawn and garden equipment, farm implements and new vehicles, there are literally millions of parts available to maintain the nation's fleet of cars, trucks, busses, construction and farming equipment, and outdoor power appliances. So, how do those parts get in the right hands? That's the job of the parts specialist.

With knowledge of how various parts function in the subsystems of power equipment and vehicles, the parts specialist meets the public face-to-face across the counter, or by telephone to determine what part is needed, and tries to supply that part—and satisfaction—to the customer. It's a tall order when you consider all the different brands, models and variants of equipment demanding parts, but it is done an average of 360,000 times a day across the U.S.—about 45 times a day for every counter person employed.

***Permission to duplicate this supplement is granted.**

Typical Career Ladder

For Those Trained as Parts Specialists

Shipping and Receiving

Delivery

Counter Person

Department Manager

Purchasing

Store Manager

Outside Sales

Owner

Personal Attributes of a Good Employee

- Ability to work with others
- Alertness, quickness of mind
- Attention to detail
- Safety conscious
- Dedication and dependability
- Desire to work
- Desire to improve one's self
- Enthusiasm and interest
- Honesty and integrity
- Put in a day's work for a day's pay
- Self-discipline

The Parts Specialist
Unit 1

Information Sheet

1. **Terms and definitions associated with a parts specialist**

   a. **Accountable** — The conduct of business affairs in such a manner that the receipt, storage, and marketing of merchandise can be systematically controlled and recorded

   b. **Free enterprise** — The freedom of private business to organize and operate for profit with minimum government regulation

   c. **Invoice** — An itemized list of goods shipped; usually accompanied with a request for payment

   d. **Jobber** — A wholesaler who sells to dealers, garages, and do-it-yourselfers

   e. **Requisition** — A written request authorizing purchase of specific goods; may be referred to as a purchase order

2. **Responsibilities of a parts specialist and their related duties**

   a. **Receiving** — Receives, stores and issues equipment, materials, supplies, merchandise, or tools in an accountable manner

   b. **Recording** — Compiles stock records in a stockroom or warehouse

   c. **Unit inventory** — Counts, sorts, or weighs incoming articles to verify receipt of items on requisitions or invoices

   d. **Inspection** — Examines stock to verify it conforms to specifications, and lists shortages

   e. **Storage** — Places articles in bins, on shelves, or in floor areas according to identifying information such as style, size, or type

   f. **Counter work** — Fills orders or issues supplies from stock; may include inside sales and waiting on customers

   Note: In most retail parts outlets, counter work also includes a significant amount of telephone contact with jobbers, dealers, and do-it-yourselfers. Many parts specialists will tell you the telephone is your key to a successful sales day and represents your most important sales tool. Efficient telephone communication is vital to correctly identifying the proper parts, part numbers, and applications and therefore satisfying the customer.

Information Sheet

g. **Inventory control** — Compiles reports of adjustments of inventory counts and stock records related to stock damage, refused shipments, merchandise returns, and material location changes

Note: With the rapid spread of computers in parts inventory control, the parts specialist must be familiar with the computer system being used by his or her employer. If records are maintained throughout the business day on the computer as sales and exchanges are completed, the compilation of inventory reports can be generated simply by printing or reading the updated files on the computer screen.

3. Areas of job opportunities for parts specialist

a. Automotive dealers

b. Automotive parts and supply stores (NAPA stores, Pep Boys, Parts Plus, Auto Zone, etc.)

c. Heavy equipment dealers

d. Implement dealers

e. Jobbers

f. Marine dealers

Note: Many marine dealers also sell and service snowmobiles and other equipment powered by small two-cycle engines.

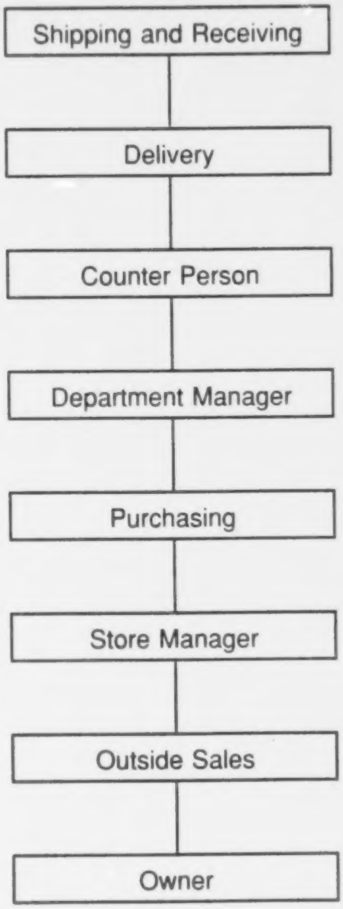
g. Small engine and outdoor equipment dealers

h. Mass merchandisers (K-Mart, Wal-Mart, etc.)

i. Motorcycle dealers

Information Sheet

4. Typical career ladder for those trained as parts specialists


Shipping and Receiving
Delivery
Counter Person
Department Manager
Purchasing
Store Manager
Outside Sales
Owner

5. Methods of compensation that may be available for parts specialists

a. Hourly — Based on total number of hours worked in a given pay period

b. Weekly — A set sum or salary agreed upon for a week's normal working hours

c. Monthly — A set sum or salary agreed upon for a month's normal working hours

Note: In weekly and monthly salary arrangements employees usually work whatever number of hours are required to accomplish the job. In most cases this is controlled by the hours the business is open, although during inventory time and certain other times, additional hours may be required.

Information Sheet

d. Commission — A method of payment based on a set percentage of merchandise sold

Note: With "straight commission" an employee is paid only a percentage of the total sales attributed to his or her efforts. In many cases this method of payment is preferred by the employee, especially if the employee has a strong sales background. Many large parts supply warehouses use staffs of telephone sales personnel paid only by "straight commission."

e. Combination of salary and commission — A method of payment which involves paying the employee a small but guaranteed salary with the incentive to sell merchandise for a percentage of the total sale.

Note: In businesses with high volumes of sales many employees make far more pay with this arrangement than they would under a straight salary or performing their work by the hour. Also, the commission provides an incentive to satisfy the customer in hopes of repeat business.

6. Fringe benefits frequently available to parts specialists

a. Employee discounts

b. Hospitalization and accident insurance

c. Paid vacation

d. Profit sharing

Note: Profit sharing provides an incentive to employees by returning a percentage of the company's profits directly to them. In many cases the company receives favorable tax treatment by the Internal Revenue Service for implementing such a plan, and employees participating in the plan tend to feel more as if the business is their own—many times resulting in improved performance on the job.

e. Uniforms

7. Working conditions of a parts specialist

a. Comfortable — Indoor work, usually air-conditioned

b. Clean surroundings

c. Public contact — In person and by telephone

Information Sheet

8. Personal attributes of a good employee and their significance

a. **Ability to work with others** — Possess a positive attitude and control one's temper.

Note: The majority of problems encountered in the workplace stem from people's inability to get along with one another. In most cases problems arise not because people don't know what they are doing, but because of problems with interpersonal relationships.

b. **Alertness, quickness of mind** — Look for unsafe conditions that could injure workers or customers or damage property; also, continually seek more efficient methods of doing one's job.

c. **Attention to detail** — Pay particular attention to the details of one's job to ensure overall successful accomplishment.

Note: Attention to detail is very important to a parts specialist. For instance, General Motors has produced many different 5.7 liter (350 cubic inch displacement) V-8 engines throughout the years. Those engines have been used in a wide variety of GM products. So, when a customer is seeking parts for a "350," it is imperative to determine the brand, year, model, and vehicle identification number (VIN) of the vehicle in question. That VIN can be made up of more than a dozen letters and numbers, so attention to detail is quite important. And, once the application is determined, there may be any number of parts in the particular engine you are servicing which have had part number changes since their original production run. Attention to detail is vital to supplying the customer with the correct part. If you fail at this point, you have a part to restock, an irritated customer, and another session of looking up parts for "a 350."

d. **Safety conscious** — Follow safety regulations and develop safe working habits; horseplay is not allowed

e. **Dedication and dependability** — Develop good work habits which include regular attendance and being on time; also, develop the ability to understand and follow instructions.

f. **Desire to work** — Do things on your own initiative; don't wait to be told.

g. **Desire to improve one's self** — Good employees always look for ways to increase their knowledge; this benefits both the employee and the employer.

h. **Enthusiasm and interest** — Take pride in your work and be willing to do more than your share when needed.

Information Sheet

i. **Honesty and integrity** — Employees should give truthful information both to customers and their employer.

j. **Put in a day's work for a day's pay** — Be conscious of waste in materials and time.

k. **Self-discipline** — Possess the ability to make one's self perform the necessary tasks at times when it is tempting to do otherwise.

Note: Self-discipline is what makes you get up in the morning to go to work on time when everything in you says turn off the alarm clock, call in sick and go back to sleep. Self-discipline is the basis for success in any field, including that of a parts specialist.

The Parts Specialist
Unit 1

Assignment Sheet 1—Interview a Parts Specialist

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Answered all questions in a clear, concise manner	______
Neat, legible handwriting	______

Introduction: One of the best ways to learn about a career is to talk with a person who is working in a job similar to one you might want. In this activity, you will have the opportunity to learn more about the parts specialist career, including specific job requirements, responsibilities, and benefits.

Directions: Interview a parts specialist in your community, then answer the following questions.

1. What is your job title? ______________________
2. What are your exact job responsibilities? ______________________
____
____
3. What are your usual working hours? ______________________
4. How did you find your job? ______________________
____
____
5. Does your job require a high school diploma? ______________________
6. What special training did you need to qualify for this job? ______________________
____
____

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Assignment Sheet 1

Where did you get the training? ______

7. Did you have other jobs in the parts service industry before this one? If so, what were they?

8. How long have you been with this company? ______ Have you worked at the same job the entire time? ______

9. What special benefits do you get by working for this company (such as paid vacations, health insurance, etc.)? ______

10. Are other jobs like yours available? If so, how would you recommend learning about them? ______

11. What are the advantages/disadvantages of this job?

Advantages: ______

Disadvantages: ______

Assignment Sheet 1

12. What advice would you give to a person who wanted to train for a job like yours?

____

____

____

____

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The Parts Specialist
Unit 1

Assignment Sheet 2—Write a Report on the Parts Specialist as a Career

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	____
Content is relevant, complete, and well organized	____

Introduction: During an upcoming class session, you will have the opportunity to meet with representatives from local parts supply businesses who are familiar with the details of a career as a a parts specialist.

During their presentations you will be given the opportunity to ask questions concerning job requirements, pay, fringe benefits, career advancement opportunities, outlook for job placement, etc. Use the following list of questions as a guide to compile information you will need to complete this assignment sheet.

Sample questions:

- What are the various career opportunities for one trained as a parts specialist?
- Describe the career ladder for an individual wishing to enter the profession of a parts specialist.
- How is compensation figured? Is it hourly, weekly, or monthly salary, base and commission, or straight commission?
- What fringe benefits are available for a parts specialist? How much are those benefits worth (in dollars) to the employee?
- Describe the working conditions one might expect to find as a parts specialist.
- What personal attributes are required to be successful as a parts specialist?

Directions: Write a report (2-3 pages, double spaced) based on what you have learned from classroom discussions and visits with professionals in the parts supply industry. Highlight the main features one might expect a career as a parts specialist to include. Also, explain why you think you would enjoy pursuing a career as a parts specialist.

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Human Relations
Unit 2

Objective Sheet

Unit Objective

After completing this unit, the student should be able to determine how behavior affects job performance and apply human relations skills in work-related situations. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to human relations with their correct definitions.
2. List four reasons why we study personality.
3. Arrange in order the steps for improving your personality.
4. Complete statements concerning characteristics of a good personality.
5. Select true statements concerning characteristics of a good fellow worker.
6. Analyze work-related situations to determine undesirable personality traits.
7. Select true statements concerning reasons why people work.
8. List three ways people are different.
9. Select true statements concerning ways for getting along with people.
10. Select ways to get along with the public.
11. List four expectations of an employer.
12. List four expectations of an employee.
13. Conduct a personality survey of a salesperson at work. (Assignment Sheet 1)
14. Determine how behavior affects job performance. (Assignment Sheet 2)
15. Apply human relations skills in work-related situations. (Assignment Sheet 3)

Human Relations
Unit 2

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Review the suggested supplemental resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.

- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet. Discuss unit and specific objectives.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Objective 1 Match terms related to human relations with their correct definitions.

Suggested Activities

- Read and discuss with students the terms and definitions presented in this section of the information sheet. **(Reading/listening for content)**

Objective 2 List four reasons why we study personality.

- Read and discuss with the students the reasons given in this section of the information sheet. Lead a class discussion on why self understanding is necessary to improve our relationships with others. **(Reading/listening for content; orally communicating a thought or idea)**

- Conduct role play activities in which various positive and negative personality traits are displayed, and discuss why it is important to recognize these traits in ourselves and others. **(Orally communicating a thought or idea; adapting to the organization's culture; critical thinking)**

Objective 3 Arrange in order the steps for improving your personality.

- Read and discuss with the students the steps for improving one's personality provided in this section of the information sheet. **(Reading/listening for content; orally communicating a thought or idea)**

- Hand out Student Supplements 1 and 2, and ask students to complete the exercises. After the exercises are complete, lead a class discussion on the various answers given. Encourage class members to explain their reasoning behind the answers they chose. **(Reading/listening for content; orally communicating a thought or idea; adapting to the organization's culture; critical thinking)**

Objective 4 Select true statements concerning characteristics of a good personality. **Objective 5** Select true statements concerning characteristics of a good fellow worker. **Objective 6** Analyze work-related situations to determine undesirable personality traits.

- Read and discuss the various traits listed in these sections of the information sheet. **(Listening for content; orally communicating a thought or idea)**

Suggested Activities

- Create several simple scenarios involving the various traits of a good personality, those of a good fellow worker, and those of an undesirable nature. Read these to the class, or conduct a role play activity to use the scenarios, then lead a class discussion on why these traits are valuable in human relations. Ask students to give examples of each from their own experience. **(Orally communicating a thought or idea; critical thinking; listening for content)**

Objective 7 Select true statements concerning reasons why people work. **Objective 8** List three ways people are different.

- Read and discuss with students these sections of the information sheet. **(Listening for content; orally communicating a thought or idea)**

- Ask class members why they work and why their parents work. Ask students what they would do day-after-day if they did not have to work because they were independently wealthy (once the novelty of being rich and no responsibility became boring). Lead a discussion on job satisfaction and what factors are at work in various individual's decisions to keep or change jobs—taking into account the differences in all individuals. Explore the various values students have about work through this discussion. **(Critical thinking; orally communicating a thought or idea)**

Objective 9 Select true statements concerning ways for getting along with people.

- Read and discuss with students the list of methods given in this section of the information sheet. **(Listening for content)**

- Ask students to give positive and negative examples of each item discussed. Ask the students how the experience made them feel and how it affected their opinion of the place of business in which it happened. **(Critical thinking; listening for content; orally communicating a thought or idea)**

Objective 10 Select ways to get along with the public.

- Discuss with students the various ways to get along with the public listed in this section of the information sheet.

Suggested Activities

- Ask students to share experiences where they have observed other people exhibiting some or all of the ways listed in the objective. **(Critical thinking; listening for content; orally communicating a thought or idea)**

Objective 11 List four expectations of an employer. **Objective 12** List four expectations of an employee.

- Read and discuss with students these sections of the information sheet. **(Listening for content; orally communicating a thought or idea)**
- Invite the owner or manager of a local parts store to visit your class to discuss customer relations and employee relations. Try to steer the session to an exploration of what the individual seeks in an employee and what is expected after the employee is hired. **(Listening for content; critical thinking; orally communicating a thought or idea)**
- Lead the class in a discussion of what class members feel are expectations they would have as employees of the recent visitor. **(Critical thinking; orally communicating a thought or idea)**

Assignment Sheet 1 Conduct a personality survey of a salesperson at work.

- Hand out assignment sheet and discuss the directions. Ask for the students to complete the assignment and return it to you when finished. **(Listening for content; critical thinking; following directions)**

Assignment Sheet 2 Determine how behavior affects job performance.

- Hand out assignment sheet and discuss directions and evaluation criteria. Ask for the students to complete the assignment and return it to you when finished. **(Critical thinking; communicating a thought or idea in written form; following directions)**

Suggested Activities

Assignment Sheet 3 Apply human relations skills in work-related situations.

- Hand out assignment sheet and discuss the directions and evaluation criteria. Ask for the students to complete the assignment and return it to you when finished. **(Critical thinking; communicating a thought or idea in written form; following directions)**
- Discuss Assignment Sheets 2 and 3 in class, steering the discussion toward constructive problem-solving in the work environment. Explain the importance of developing workplace skills in the areas of problem solving, self-esteem, interpersonal relations, negotiation, teamwork, organizational effectiveness, and leadership. Show how they relate to situations given and possible solution to problems. **(Orally communicating a thought or idea; listening for content; critical thinking)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of the assignment sheets.
- Give and evaluate written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores on Unit Evaluation Form.
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *An Introduction to Agricultural Business and Industry, Student Manual.* Danville, IL: Interstate Printers.
- Hiserodt, Donald D. *Psychology and Human Relations in Marketing.* New York: McGraw-Hill, Inc.
- *Human Relations in Business, Student Manual.* Columbus, OH: Agricultural Education Services, Ohio State University.
- *Job Application.* Columbia, MO: Instructional Materials Laboratory, University of Missouri.

Human Relations
Unit 2

Answers to Student Supplements

Student Supplement 1

A good discussion is more important than 100 on the quiz.

1.	d	There is contact with all of these groups but the *close* contact is with other workers.
2.	b	This is a generalization but all people like to be treated with respect, considered important, treated fairly; there are many individual differences within the group.
3.	d	All three of these apply—it could be any of these.
4.	d	
5.	c	Do unto others as you would have them do unto you.
6.	c	
7.	a	
8.	c	
9.	b	To be successful, the employee needs to know about the products, services, etc.
10.	c	
11.	c	Explain what exploiting means.
12.	c	
13.	c	
14.	c	
15.	d	
16.	d	
17.	a	
18.	b	
19.	b	
20.	b	
21.	d	This is part of respect.
22.	c	
23.	c	
24.	a	
25.	c	

Student Supplement 2—Confidential information to be retained by student; evaluation should be only on classroom discussion.

Human Relations
Unit 2

Answers to Assignment Sheets

Assignment Sheet 1—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Evaluator note: The content of personal observations and opinions requested of the student should not be graded per se; there are no wrong or right answers. The evaluator should look for seriousness of effort and completeness rather than for "correctness."

Assignment Sheet 2—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 3—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Evaluator note: Answers will reflect the student's ability to apply information presented in the information sheet. Personal opinions will also be part of the student's responses. The evaluator should look for seriousness of effort and logical reasoning in evaluating each answer.

Human Relations
Unit 2

Answers to Written Test

1. a. 4
   b. 3
   c. 2
   d. 1

2. List should contain the following:

   a. To understand ourselves
   b. To understand others
   c. To better live in society
   d. To improve our personality

3. a. 4
   b. 2
   c. 5
   d. 1
   e. 3

4. a. Cheerful
   b. Friendly
   c. Tactful
   d. Self-confident

5. c, d, e, h

6. a. Gossiping
   b. Passing the buck
   c. Apple polishing
   d. Politicking
   e. Clique forming

7. a, d, e, f

8. List should contain the following:

   a. Backgrounds
   b. Attitudes
   c. Abilities

9. b, d, e, h, i

10. a, b, c, e, f

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Answers to Written Test

11. Any four of the following:

    a. Loyalty
    b. Proper use of ability and willingness to follow directions
    c. Cooperation
    d. Good working relationships
    e. Good work habits
    f. Honesty

12. List should contain the following:

    a. Money
    b. Pleasant and safe working conditions
    c. Recognition of accomplishment
    d. Security

Human Relations
Unit 2

Written Test

Name ______________________________ Score ______________

1. Match terms related to human relations with their correct definitions. Write the numbers on the blanks.

______a. A distinguishing quality or characteristic that contributes to personality

______b. The sum of all specific traits that are consistently observable in an individual's behavior

______c. The psychological need to be accepted by others in one's own age group or by others of one's own social or vocational status

______d. To make unethical use of another person for one's own advantage

1. Exploit
2. Peer pressure
3. Personality
4. Trait

2. List four reasons why we study personality.

a. ____

b. ____

c. ____

d. ____

3. Arrange in order the steps for improving your personality by inserting the correct number in front of each step.

______a. Develop a plan of action and self-discipline.

______b. Determine how your personality rates.

______c. Work on the plan of action.

______d. Determine your personality can be improved.

______e. Analyze this rating trait by trait.

Written Test

4. Complete statements concerning characteristics of a good personality. Write the correct word in the blanks provided.

__________ a. An upbeat, consistent mood that is not affected by drastic swings into depression and self-pity would be characterized as (cheerful, naive).

__________ b. A quiet person who seems always to be guarding against criticism and attack by avoiding co-workers would not be characterized as (paranoid, friendly).

__________ c. A worker who takes undeserved criticism and profanity from an irate customer by quietly talking to the customer and refusing to become irate in return is (tactful, insensitive).

__________ d. A co-worker of yours always seems to know just where she stands with the boss, no matter what situation arises. Her personality at work would be termed (arrogant, self-confident).

5. Select true statements concerning characteristics of a good fellow worker. Place and "X" in the blanks provided for statements that are indicative of a good fellow worker.

______ a. Gina is a highly productive worker who is never late, is cheerful and honest, and enjoys publicly making fun of the boss's baldness.

______ b. Although company policy calls for all employees to wear safety shoes in the warehouse, Yolanda quietly continues to wear her Reeboks because she works in the warehouse office where there are few falling objects and there is very little chance she will be injured.

______ c. Ralph, a highly productive, mature employee isn't well liked by his immediate work team because he informed the boss of horseplay that could have caused serious injury and lost time.

______ d. Michelle was the last loader on the loading dock on Friday evening before a three-day holiday began. At the end of her shift, the truck she was loading still required ten more cases of motor oil before it was fully loaded. To load the cases would mean staying beyond her pay period and she would receive no additional pay, but without the truck fully loaded the shipment would be delayed until the following Tuesday morning. She stayed, loaded the cases and went home 20 minutes late.

______ e. Marcus was shoveling snow outside the parts store, when his supervisor stepped out and offered this friendly advice: "If you'll slow down, and make steady motions with your shovel, you'll move more snow with a lot less effort!" Marcus was infuriated that someone thought he didn't know how to shovel, but he didn't respond angrily. He changed his method and discovered the supervisor was correct.

Written Test

______f. Kim was in charge of keeping invoice files up to date for a local motorcycle repair shop. Because of changes going on, she was further and further behind as each day passed. Her supervisor asked her for ideas she might have on streamlining her work station and finding ways to stay ahead of the work load. Kim, a long time employee with a lot on her mind, replied . . . "Don't ask me, I just work here. Making this place function is your job!"

______g. Because of his excellent work record Bill was placed on a company expense account which allowed him to charge gasoline on a company credit card for miles he drove for business. Although most of the time Bill used his privileges only for company business, several weekends a year he would take his family on overnight outings using company fuel without reporting it. The total amount of this personal use was 68 gallons of gasoline.

______h. Karla partied hard several nights each week, but she loved her job and made every effort to devote herself to being friendly and alert each day at work. With almost unboundless energy, it was always Karla who sent co-workers cards congratulating them on births, graduations, and good things that happened to them at home and at work.

6. Analyze the following scenarios to determine undesirable personality traits (apple polishing, clique forming, gossiping, passing the buck, politicking). Write the traits in the blanks provided.

____________a. Leroy loved to be "in" on the latest happenings concerning his co-workers and enjoyed being known as the source of most informal information circulating around the office. Leroy also liked to tell a good story, so when he passed information along to others it took on a more dramatic flair, but people listened and Leroy liked that.

____________b. Nina had been passed over for a manager's position by new management after the company had been sold and felt "stuck" in the secretarial post she had held for several years. When callers would telephone and question new policies being put in place, Nina would respond . . . "Well, I don't know anymore. The new owners are responsible for that. You'll just have to contact them!"

____________c. When Ben's department was placed under a new supervisor who was an avid golfer, Ben began showing up at the golf course to praise his new boss on his swing and low scores. Knowing he might be up for a promotion within the department soon, Ben even sent his new supervisor a box of golf balls with his name inscribed on them.

______ d. Allen, an unorganized, insecure individual, was in charge of promotion for a small number of products his company produced. Although continually depending upon his assistant, he made it a habit to always take credit for any good ideas which came from the assistant, and to downplay any initiative the assistant was showing. Numerous times Allen would assign the assistant research work to help prepare his own presentations, and take full credit for the results—all the while complaining about how overworked he was.

______ e. Yolanda, Hector, and Lia had worked together as a work team for nine years. When the company expanded operations, Millie was hired to join the team as a fourth member. Although they accepted her help on the job, Yolanda, Hector, and Lia would make every effort to exclude Millie at lunch time, or during company parties and assemblies.

7. Select true statements concerning reasons why people work by placing an "X" in the appropriate blanks.

______ a. Ability to support self and family

______ b. Decrease welfare rolls

______ c. Need for quality schools

______ d. Wealth

______ e Satisfaction

______ f. Power

8. List three ways people are different.

a. ______

b. ______

c. ______

Written Test

9. Select true statements concerning ways to get along with people by placing an "X" in the appropriate blanks.

_______a. No matter what the situation, voice your opinion so everyone will know where you stand.

_______b. Retain an open mind on all debatable questions, even though you're convinced you know the true situation.

_______c. Don't get involved in the lives of others. If you don't know their problems you won't get hurt.

_______d. Seldom make promises, but when you do . . . see that you fulfill them regardless of the cost.

_______e. Never miss a chance to say something good about someone.

_______f. Don't always go around with a smile on your face acting happy; people will think there's something wrong with you.

_______g. If you've done something well, or accomplished a difficult task, be certain you tell your co-workers and supervisors about it.

_______h. Disregard negative comments made about you.

_______i. Although your co-worker is lazy and sometimes comes to work drunk, you refuse to criticize her when others in the office are talking behind her back.

10. Select ways to get along with the public by placing an "X" in the appropriate blanks.

_______a. Be helpful.

_______b. Be tolerant.

_______c. Be tactful.

_______d. Treat the public as they treat you.

_______e. Be sincere.

_______f. Be courteous.

Written Test

11. List four expectations of an employer.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

12. List four expectations of an employee.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

*Permission to duplicate this test is granted.

Human Relations
Unit 2

Unit Evaluation Form

Student Name ______________________ Unit Rating __________

Assignment Sheet 1—Conduct a Personality Survey of a Salesperson at Work Rating _____

Comments: ______________________________________

____

Assignment Sheet 2—Determine How Behavior Affects Job Performance Rating _____

Comments: ______________________________________

____

Assignment Sheet 3—Apply Human Relations Skills in Work-Related Situations Rating _____

Comments: ______________________________________

____

Written-Test Scores

Pretest _____ Posttest _____ Other _____

Other ______________________________________

____

Teacher Signature ______________________ Date __________

Student Signature ______________________ Date __________

***Permission to duplicate this form is granted.**

Human Relations
Unit 2

Information Sheet

1. **Terms and definitions related to human relations**
    a. **Exploit** — To make unethical use of another person for one's own advantage
    b. **Peer pressure** — The psychological need to be accepted by others in one's own age group or by others of one's own social or vocational status
    c. **Personality** — The sum of all specific traits that are consistently observable in an individual's behavior
    d. **Trait** — A distinguishing quality or characteristic that contributes to personality
2. **Reasons why we study personality**
    a. To understand ourselves
    b. To understand others
    c. To better live in society
    d. To improve our personality
3. **Steps for improving your personality**
    a. Determine your personality can be improved.
    b. Determine how your personality rates.
    c. Analyze this rating trait by trait.
    d. Develop a plan of action and self-discipline.
    e. Work on the plan of action.
4. **Characteristics of a good personality**
    a. **Cheerfulness** — An upbeat, consistent mood that is not affected by drastic swings into depression and self-pity
    b. **Friendliness** — A genuinely open mannerism, lacking defensive gestures or activities
    c. **Forcefulness** — A strong personality trait that displays self-confidence and one's belief in one's ability; the lack of ambiguity

Information Sheet

d. **Self-confidence** — An overall air of knowledge of one's job or position and security with one's self as an important, contributing member of society

e. **Tactfulness** — The ability to deal with co-workers and customers in a polite, kind manner despite the circumstances or the mood of others present

5. **Characteristics of a good fellow worker**

a. Adhering to business rules and policies

Note: Most businesses have a set list of policies and procedures built up over time to guide employee's actions in given circumstances. Many times these guidelines are designed to cover the business in legal controversies and to ensure the firm remains within local, state, and federal laws concerning personnel matters, labor relations, Occupational, Safety and Health Administration (OSHA) regulations, and other regulatory statutes.

b. Respecting authority

Note: Businesses are organizations created to conduct economic activity, hopefully in the most efficient and profitable manner. That usually means some one is responsible for the overall operation of the business, with others serving as that individual's delegates. For the business to function as it was designed, each layer of delegation must be able to depend upon its employees to follow the leadership and respect the authority the business has given them.

c. Carrying out assigned responsibilities

Note: If a business hires an employee there are certain functions that individual is expected to carry out . . . otherwise there would be no reason to pay for that individual's services. If assigned responsibilities are not carried out, the expense of the employee's wage or salary is being wasted and more than likely, another employee is having to accomplish his or her own responsibilities plus those of the non-productive employee. In this case, the wage and/or salary of both employees is being inefficiently spent.

d. Being willing to put forth more than minimal effort

e. Showing your interest by being bright eyed and alert

f. Showing your admiration and appreciation

Note: Everyone likes recognition and attention. As a co-worker you can go far in human relations by being aware of this need in your fellow workers. Compliments on a job well done, or congratulations for important events in their lives help show you are a caring, friendly associate.

Information Sheet

g. Making good use of constructive criticism

Note: By not becoming defensive when someone suggests a better, or different way of doing something, you can display your maturity and willingness to learn. Sometimes, just listening to another person's suggestions is a positive human relations activity . . . making the other person feel important. And, many times the other person may have a valid suggestion that will make your job easier.

h. Contributing new ideas

Note: Any organization is just as efficient and powerful as its staff. If you have ideas that would help make the organization more efficient in serving its customers, and thereby more profitable, those around you and your leaders will appreciate it. Too many times employees who don't have the best interest of the business at heart display that attitude by saying "Don't ask me, I just work here . . . "

i. Being honest

Note: Honesty in dealing with co-workers and customers is probably one of the most important factors in success in business. If a person cannot be trusted to tell the truth when asked, his or her credibility is always in question.

6. Undesirable personality traits and their meanings

a. **Apple-polishing** — Extending attention or service to one in a higher position with the hope of personal gain

b. **Clique forming** — Getting with the "in" crowd because of peer group pressure or for the sake of personal gain

c. **Gossiping** — Repeating rumors or distorted information about a person, a situation, or an ethnic group

d. **Passing the buck** — Dodging responsibility or blame by suggesting that persons in higher positions are responsible or should make a decision or answer for a fault

e. **Politicking** — Exploiting others for personal gain

Information Sheet

7. **Reasons why people work**

   a. Ability to support self and family

   b. Acceptance of peers

   c. Power

   d. Satisfaction

   e. Wealth

   Note: Although these are listed as separate items, each individual personality will possess a combination of reasons with varying importance placed on each. For instance, wealth may be desired for the power it brings. Satisfaction may only come when power is attained, or it may be attained when self and family are supported. The importance any one individual places on a single reason for working is totally a function of that person's background and value system.

8. **Ways people are different**

   a. Backgrounds

   b. Attitudes

   c. Abilities

   Note: No two people are alike, and individuals within a group are all different. Each person is an individual.

9. **Basic ways to get along with people**

   a. Watch what you say; always say less than you think.

   Note: How you say something often counts more than what you say.

   b. Make promises sparingly and keep them faithfully, no matter what it costs.

   c. Never let an opportunity pass to say a kind and encouraging thing to or about someone.

   Note: Praise good work done, regardless of who did it. If criticism is merited, criticize helpfully, never spitefully. Many times criticism can be left to others with no ill effects on you.

Information Sheet

d. Be interested in others.

Note: Be interested in others' pursuits, their welfare, their homes, and families. Let everyone you meet feel that you regard them as a person of importance.

e. Be cheerful.

Note: Keep the corners of your mouth turned up. Hide your pains, worries, and disappointments under a pleasant smile. Many times just smiling will make you feel better. Laugh at good stories and learn to tell them.

f. Retain an open mind on all debatable questions.

Note: Discuss but don't argue. It is a mark of superior minds to disagree and yet be friendly.

g. Let your virtues speak for themselves, and refuse to talk of another's vices.

Note: Discourage gossip, and make it a rule to say nothing of another unless it is something good.

h. Be careful of others' feelings.

Note: Wit and humor at the expense of another are rarely worth the effort, and may hurt where it is least expected.

i. Pay no attention to ill-natured remarks about you.

Note: Simply live so nobody will believe them.

j. Don't be too eager to receive praise.

Note: Do your work, be patient, keep your disposition honest, forget self, and you will be respected and rewarded.

Information Sheet

10. **Ways to get along with the public**
    a. Be courteous.
    b. Be tactful.
    c. Be sincere.
    d. Be helpful.
    e. Be tolerant.
    f. Be pleasant.

    Note: Your attitude and performance must make a positive contribution to the operation.

11. **Expectations of an employer**
    a. Loyalty
    b. Proper use of ability and willingness to follow directions
    c. Cooperation
    d. Good working relationships
    e. Good work habits
    f. Honesty

12. **Expectations of an employee**
    a. Money
    b. Pleasant and safe working conditions
    c. Recognition of accomplishment
    d. Security

Human Relations
Unit 2

Student Supplement 1—Answer Questions Concerning Human Relations with Fellow Workers

Name ______________________ Overall Rating __________

Evaluation criteria	Rating
Correct answers	______
Contribution to class discussion	______

Directions: Choose the answer which is MOST correct for each of the following questions. Place your selection in the blank at the left. Be prepared to explain the reasoning behind the answers that were selected.

______ 1. Many occupations deal primarily with machines, equipment, or paper work; that is, they deal with things. In business, however, most of the jobs involve close contact with:

a. employers
b. supervisors
c. people
d. other workers

______ 2. As a group, people are very much:

a. different
b. alike
c. it is difficult to say

______ 3. It is possible that the things which you enjoy may:

a. appeal to others
b. not appeal to others
c. be distasteful to others
d. all of the above

______ 4. Which of the following do most people have in common?

a. right to work at a job of their choice
b. desire to get ahead
c. desire to be accepted and approved
d. all of these
e. none of these

Student Supplement 1

______ 5. The best way to achieve your goals in life is to follow your rights and desires and:

a. also the wish of your boss
b. what your parents say
c. the Golden Rule
d. just what you feel like doing

______ 6. Do the best work you can for the important jobs and:

a. don't worry about the little jobs
b. let others do the little jobs
c. also do the most routine jobs well
d. everything else will take care of itself

______ 7. Plus doing the best work you can, it is important to:

a. learn as much as you can about your company
b. see what you can get on your boss
c. keep up on the latest gossip
d. be seen and not heard

______ 8. The right to think and act as individuals ________________ normally shared by most.

a. is not
b. may be
c. is

______ 9. The statement that "retailing is people" is:

a. not true
b. only part true
c. all true

______ 10. Which of the following is not a desirable trait of an employee?

a. sense of humor
b. tact
c. indifference
d. initiative

______ 11. Exploiting others toward our own efforts is:

a. desirable
b. OK if you can get away with it
c. undesirable
d. not too bad

Student Supplement 1

______12. When you are criticized by your superior, it is best to:

- a. act indifferent
- b. tell him/her to do it himself/herself
- c. take it constructively
- d. shrug it off

______13. Loyalty includes:

- a. working hours only
- b. both the time to and from work
- c. all the time
- d. just when you feel like it

______14. To approach your job with enthusiasm, it is necessary to:

- a. fool the boss
- b. impress your co-workers
- c. be glad to be part of the team

______15. It is not necessary to be friendly as long as you:

- a. do your job
- b. act as though you are
- c. get to work on time
- d. none of these

______16. When you have a question, it is best to:

- a. do the job the way you think it should be done
- b. wait and ask it later
- c. not bother your boss with it
- d. ask it when it needs to be asked

______17. When you have joined a clique, you have:

- a. picked sides
- b. helped yourself
- c. joined the "in" group
- d. become a member of the team

______18. A good way to get along in your new job is to:

- a. be a "know-it-all"
- b. be willing to learn
- c. show your co-workers how smart you are
- d. run to your boss with every question you have

Student Supplement 1

______19. Showing that you are not afraid of work means to:

a. work as hard as you can
b. be willing to tackle any job assigned
c. work harder than any of your co-workers

______20. The need to show appreciation to fellow workers:

a. will get you nowhere
b. is strongest when you are new
c. isn't really necessary at all
d. is just on the surface

______21. You should start calling your co-workers by their:

a. first names as soon as possible
b. nicknames to show you are really in
c. last name only
d. proper names until you have been around awhile or are told differently

______22. If you do all of the things we have suggested you will have:

a. everyone liking you
b. a few friends
c. a better chance of being well-liked
d. the reputation for being an apple-polisher

______23. The people you can learn the most from are:

a. always your bosses
b. your best buddies
c. those who show an interest in you
d. the ones you eat lunch with

______24. Human behavior is usually:

a. pretty easy to understand
b. not too predictable
c. easy to predict
d. none of your business

______25. The total morale of your business is:

a. beyond your control
b. a matter for the boss
c. each employee's problem
d. unimportant

Human Relations
Unit 2

Student Supplement 2—Rate Your Grooming and Wardrobe Habits

Name ______________________ Overall Rating __________

Evaluation criterion	**Rating**
Contribution to class discussion	______

Directions: Rate yourself on each of the following questions. Use the scale of 6—Always, 4—Usually, 2—Occasionally, and 0—Never. When a question refers specifically to the opposite sex, place N/A (Not Applicable) in the blank and score it as 6. When you have completed the evaluation, total your score and compare to the rating scale provided.

Questions	**Rating**
1. Do you take a bath or shower daily?	______
2. Do you use an effective deodorant or antiperspirant daily?	______
3. Do you shave as often as needed?	______
4. Do you clean your face thoroughly at least twice a day (more often if you have oily skin)?	______
5. Do you completely remove makeup before bedtime?	______
6. Do you check fingernails daily and repair or clean as necessary?	______
7. Do you wash hair twice weekly (more often if needed)?	______
8. Do you have hair cut or trimmed regularly?	______
9. Do you use a dandruff shampoo and/or creme rinses and conditioners if needed?	______
10. Do you brush your teeth at least twice daily?	______
11. Do you use a mouthwash daily?	______
12. Do you make the daily effort to apply makeup so that it looks fresh and natural?	______
13. Do you get enough sleep and rest so that you feel refreshed?	______
14. Do you put on clean hosiery and undergarments daily?	______
15. Are your clothes clean?	______

Student Supplement 2

	Questions	Rating
16.	Do your clothes coordinate attractively?	______
17.	Do you check garments for split seams, ripped hems, or loose buttons before wearing?	______
18.	Do you take a good look at yourself in a full-length mirror before leaving the house?	______
19.	Do you take a few minutes during the day to freshen your makeup and comb your hair?	______
	Total	______

Rating

100 - 114	Great, you take pride in your appearance
85 - 99	Good, you'd probably pass inspection
70 - 84	Fair, you're not really trying
Less than 70	Poor, your best friend won't even tell you

Human Relations
Unit 2

Assignment Sheet 1—Conduct a Personality Survey of a Salesperson at Work

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
All questions have been answered	______
Student applied serious effort while completing this assignment	______

Introduction: It has been said that one of the best ways to study behavior is through observation. In this activity, you will have an opportunity to observe a salesperson at work and record your findings. Remember that an employee represents both the employer and the business, and the success of the business depends on customer satisfaction.

Directions: Visit a store for the purpose of making a personal purchase or to observe someone else making a purchase and rate the personality of the salesperson involved. Fill out the first three lines of the survey before entering the store, but in order to remain inconspicuous, it will be necessary to read the survey form carefully, make mental notes during the purchase or observation, and record your findings immediately afterward.

Salesperson Personality Survey

Your name ______________________ Date ______________

Store name ______________________ Address ______________

Time of day ______________ Weather conditions ______________

Nature of purchase or observation ______________________________

____

Which characteristic of a good personality did the salesperson best exhibit; cheerfulness, friendliness, forcefulness, self-confidence, or tactfulness? (If none, write none)

____

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Assignment Sheet 1

Did the salesperson exhibit bodily movements, mannerisms, or facial expressions that helped make the customer feel at ease? (Explain your answer)

____

____

On a scale of 1 to 10 with 1 being the highest, rate the salesperson's grooming and dress.
Rating (circle one): 1 2 3 4 5 6 7 8 9 10

What particular items contributed to or detracted from the salesperson's grooming and dress?

____

Indicate whether the transaction was cash, charge, check, or credit card, and state specifically how the salesperson handled this part of the transaction. For instance, did the salesperson leave the customer's bill on the counter while clearly counting out change, or did the salesperson exhibit comfortable knowledge of the credit card machine or check cashing procedure? ______________________________

____

What were the salesperson's final words to the customer? ____________________

____

State in your own words how you feel the personality of the salesperson reflects the personality of the store in general.

____

____

For what reason do you think the customer shopped at that particular store?
(Circle one):
Low prices
Sales prices
Convenience
Quality products and service
Highly advertised store
Good reputation of store

Do you think the time of day or the weather conditions had anything to do with the personality displayed by the salesperson or the customer? (If your answer is "yes", explain.)

____

Assignment Sheet 1

On a scale of 1 to 10 with 1 being the highest, rate the salesperson's total effectiveness.
Rating (circle one): 1 2 3 4 5 6 7 8 9 10

Would the information you have gathered in this survey be of any value to the salesperson's supervisor? (Explain your answer) ______________________________

____

Whom did you most feel like while you were conducting this survey?
(Circle one): The boss
A professional evaluator
An interested learner
An inexperienced observer

Your signature ______________________________

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Human Relations
Unit 2

Assignment Sheet 2—Determine How Behavior Affects Job Performance

Name ______________________ Overall Rating __________

Evaluation criteria	**Rating**
Ability to discern positive and negative attitudes	______
Logical reasoning demonstrated	______

Introduction: Having a good working relationship with co-workers is important in maintaining a positive working environment. Therefore, it is important for an individual to understand how one person's negative behavior in work-related situations can affect other peoples' behavior. Without a positive working environment, individual job performance among employees will decline, and both time and money may be lost. Following this activity, you will have an opportunity to discuss your answers and explain your rationale.

Directions: The following statements reflect either a positive or a negative attitude. For each statement, determine whether it is positive or negative, tell who might be affected by this attitude, and explain why. The above criteria will be used to evaluate your performance.

1. "I think I'll leave work five minutes early because I came in five minutes early. Nobody will ever know."

   ☐ Positive ☐ Negative: Who is affected? ______________________

   Why? ______________________

   ____

2. "No one is looking. They won't miss that air filter if I take it. Everyone else does it."

   ☐ Positive ☐ Negative: Who is affected? ______________________

   Why? ______________________

   ____

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Assignment Sheet 2

3. "Oh my gosh! I overslept! Guess I'll call the boss and tell him I am sick."

☐ Positive ☐ Negative: Who is affected? ____________________

Why? ____________________

____

4. "It's Friday and, wow, is it ever beautiful outside! I'll leave now and on Monday tell the boss I forgot to clock out. Nobody will ever miss me."

☐ Positive ☐ Negative: Who is affected? ____________________

Why? ____________________

____

5. "I'm not paid to take messages for my co-workers. I think I'll just forget about that call."

☐ Positive ☐ Negative: Who is affected? ____________________

Why? ____________________

____

6. "The used car sales manager just told me off. Man, am I ever gonna get even. Wait till I tell the other employees."

☐ Positive ☐ Negative: Who is affected? ____________________

Why? ____________________

____

7. "My supervisor asked me to do this task step by step until I learned the procedure. That will take forever. I'll do it my way. It'll be lots quicker."

☐ Positive ☐ Negative: Who is affected? ____________________

Why? ____________________

____

Assignment Sheet 2

8. "Nobody in the department likes him. I guess I don't either. I don't know why, though."

☐ Positive ☐ Negative: Who is affected? ______________________________

Why? ____

____

9. "I would like to make a doctor's appointment for my annual physical. Would it be permissible for me to leave work for the appointment? If it's all right, which day would be best?"

☐ Positive ☐ Negative: Who is affected? ______________________________

Why? ____

____

10. "The boss is two years younger than me but seems to know a lot about the business. I feel funny being older and more experienced than my boss is."

☐ Positive ☐ Negative: Who is affected? ______________________________

Why? ____

____

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Human Relations
Unit 2

Assignment Sheet 3—Apply Human Relations Skills in Work-Related Situations

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
All questions answered	____
Logical reasoning demonstrated	____

Introduction: Sometimes it is difficult to maintain a positive attitude in work-related situations, especially if a situation creates stress and/or problems for you. Developing human relations skills provides you with the tools needed to handle difficult situations. In this activity, you will react to various situations that may occur in the workplace.

Directions: Describe what you would do in the following situations. Give the reason why you would behave in the manner you describe. The above criteria will be used to evaluate your performance.

1. A new employee is introduced to your department. The other employees do not like the individual but you do. After one week on the job, tricks are being played on this person. What would you do? Why?

____

____

____

____

____

____

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Assignment Sheet 3

2. You think the last task you did on your job was the most perfect one you have ever done, but your boss corrects your mistakes in front of your fellow employees. What would you do? Why?

____

____

____

____

____

____

3. Your best friend at work is frequently absent which doubles your work load. What would you do? Why?

____

____

____

____

____

____

4. It is 5:00 p.m. and everyone is going home for the day. You see your supervisor place money from the cash register in a coat pocket. What would you do?

____

____

____

____

____

____

Assignment Sheet 3

5. You must be absent from work. What would you do? Why?

6. You have negative thoughts about your employer. What would you do? Why?

Work Communication Skills
Unit 3

Objective Sheet

Unit Objective

After completing this unit, the student should be able to use both verbal and written communication effectively. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms associated with work communication skills to their correct definitions.
2. State the purposes of communication.
3. Describe the essential elements of effective communication.
4. List common barriers to effective communication.
5. List four factors necessary for communicating product information.
6. Distinguish between examples of positive and negative body language.
7. Complete guidelines for effective listening.
8. Discuss in writing guidelines for following verbal and written directions.
9. Complete guidelines for improving verbal communication.
10. Correct false statements about guidelines for improving written communication.
11. Complete guidelines for giving verbal and written directions.
12. Select from a list guidelines for using the telephone correctly.
13. Discuss in writing the procedure for handling interruptions with telephone customers.
14. List five items of information needed to complete a telephone order.
15. List three ways to use the telephone as a sales and advertising tool.

Objective Sheet

16. Select true statements concerning other tips for intelligent telephone use.
17. Identify your listening behaviors. (Assignment Sheet 1)
18. Follow verbal directions. (Assignment Sheet 2)
19. Follow written directions. (Assignment Sheet 3)
20. Give verbal directions while demonstrating a task. (Assignment Sheet 4)
21. Take a telephone order. (Assignment Sheet 5)

Work Communication Skills
Unit 3

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below, and plan classroom activities. Review the suggested supplemental resources.

  Plan your presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit. See ordering information in the suggested resources section.
- Make transparencies from transparency masters included in this unit.
- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet. Discuss unit and specific objectives.

Teaching Suggestions

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Objective 1 Match terms associated with work communication skills to their correct definitions.

- Read and discuss with the students the terms and definitions presented in this section of the information sheet. **(Reading; listening for content)**

Objective 2 State the purposes of communication.

- Provide examples to illustrate each purpose. **(Listening for content)**

Objective 3 Describe the essential elements of effective communication.

- Use Transparencies 1 and 2 and the explanation below to illustrate the communication cycle:
    - The *sender (Date Man)* develops a message that the *receiver (Banana Man)* can understand: "Please throw me a banana!"
    - Date Man sends a clear and simple message. He is specific and does not just write "I want fruit," for instance. He tells what fruit, how many fruits, and how the exchange should take place.
    - Date Man decides that the *medium* will be a written note conveyed to the receiver in a bottle. Undoubtedly the distance between the sender and receiver is too great for verbal communication.
    - The *message* is received and the medium can be understood. Obviously Banana Man can read and understand English.
    - Banana Man demonstrates that he understands the message by providing *feedback*: He throws Date Man one banana as requested.

Suggested Activities

— What would happen if Banana Man had not been able to read? If he had not been able to understand English? If the bottle and message had not reached him? Any of these things would have been *barriers* to communication, just as the shark is a barrier that physically separates the two shipwrecked men. **(Listening for content; applying knowledge to other situations)**

Objective 4 List common barriers to effective communication.

- Have students recall instances in which they experienced communication problems. Ask students to explain how the situation could have been improved. **(Communicating a thought or idea; analyzing what has been read to a specific task)**
- Discuss common barriers to effective communication. Use Transparency 3, "Communication Barriers," to illustrate your discussion. **(Reading; listening for content)**
- Provide examples or demonstrate each barrier listed. Ask the students to provide you with examples of other barriers to effective communication. **(Communicating a thought or idea; listening for content)**

Objective 5 List four factors necessary for communicating product information.

- Read and discuss the various factors and tips listed in this section of the information sheet. **(Listening for content; orally communicating a thought or idea)**
- Role play situations in which students introduce themselves to one another assuming different job titles and situations in which they might find themselves in the workplace. Then have them work with specific information (product information) to demonstrate barriers in conveying information and to introduce methods of avoiding them. **(Orally communicating a thought or idea; adapting to the organization's culture)**

Suggested Activities

Objective 6 Distinguish between examples of positive and negative body language.

- Review the information presented in the information sheet. Discuss the concepts of *positive* and *negative* body language. **(Applying technical terms)**
- Provide students with 3 × 5 cards on which are written such words as *anger, dejection, sadness, happiness, nervousness, fear, exhaustion, uncaring, proud, ashamed.* Call on the students to convey the meanings on their cards through body language. **(Applying technical terms; communicating an idea through nonverbal language)**
- Have students gather illustrations from magazines (or photographs) of people demonstrating different facial expressions or body language. Use the illustrations either to make a bulletin board or to show to the class in flashcard style and have students discuss and decide what is being nonverbally communicated. **(Applying knowledge to other situations; communicating an idea)**
- Provide students with the opportunity to do supplemental reading on the impact of body language—especially in the business world. **(Reading; learning how to learn)**

Objective 7 Complete guidelines for effective listening.

- Ask students whether they view speaking, writing, or listening as more important. Explain that listening is an integral part of communicating. **(Communicating a thought or idea; listening for content)**
- Show the video *You're Not Listening!* Encourage students to take notes. Discuss in class the main points in the video. **(Orally communicating a thought or idea; writing)**
- Review with students the introduction and directions to Assignment Sheet 1, "Identify Your Listening Behaviors." Complete in class, and then discuss the results with the class. **(Listening for directions; listening for content)**

Suggested Activities

Objective 8 Discuss in writing guidelines for following verbal and written directions. **Objective 9** Complete guidelines for improving verbal communication.

- Read with the students the guidelines outlined in these objectives in the information sheet, and have students discuss the information presented. **(Listening for content; communicating ideas)**

- Invite a trained speaker (someone from Toastmasters perhaps) or a school counselor to discuss ways to improve verbal and written work communication. **(Listening for content)**

- Read the directions in Teacher Supplement 1, "Listening Test Questions," so that students may complete Assignment Sheet 2, "Follow Verbal Directions." After completing in class, discuss the assignment with students. **(Listening for directions; listening for content; communicating thoughts and ideas)**

- Hand out Assignment Sheet 3, "Follow Written Directions," read the introduction and directions, and have students complete in class. Discuss the results with the class. **(Listening/reading for directions; communicating a thought or idea)**

Objective 10 Correct false statements about guidelines for improving written communication.

- Show the video *Making the Most of Yourself*. Encourage students to take notes. Discuss the main points of the video in class. **(Orally communicating a thought or idea; writing; listening for content)**

- Show students copies of a working rough draft and a finished polished report. Lead a class discussion that emphasizes the importance of rereading and revising. **(Listening for content; learning to learn; orally communicating a thought or idea)**

Suggested Activities

Objective 11 Complete guidelines for giving verbal and written directions in a work situation.

- Show the video *Say That One More Time*. Encourage students to take notes. Discuss the main points in the video with the class. **(Orally communicating a thought or idea; writing)**

- Explain the importance of giving and following directions correctly and how these two skills are tied to listening and verbal communications. **(Listening for content)**

- Hand out Student Supplement 1, "Guidelines for Giving a Demonstration Talk." Review the guidelines with the students and discuss in class. Then, give a demonstration talk yourself that illustrates these guidelines. **(Reading/listening for content; learning how to learn)**

- Hand out Assignment Sheet 4, "Give Verbal Directions While Demonstrating a Task," and review the introduction and evaluation criteria. Ask for and answer any questions, and then assign each student a presentation date. **(Reading/listening for content; listening for directions; communicating thoughts and ideas)**

Objective 12 Select from a list guidelines for using the telephone correctly.

- Show the video *Telephone Communications Skills*. Encourage students to take notes. Discuss the main points in the video with the class. **(Listening for content; orally communicating a thought or idea; writing)**

- Hand out Student Supplement 2, "Analyze Voice Quality." Review the directions and voice rating scale with students. Provide students with tape recorder and tapes so that they may record their voices. Discuss what students found out about how they sound.

- Have students pretend that they represent a local parts supply business and role-play situations in which they must deal over the telephone with customers' questions or complaints. Critique the role-play situations with the class. **(Orally communicating a thought or idea; applying technical terms; listening)**

Suggested Activities

- Videotape students as they role-play various situations on the telephone. Let students view the tape to see how they really sound and look to others. Have the class critique the video. **(Orally and visually communicating a thought or idea; applying technical information; listening)**

- Invite a local disc jockey or representative from a television station to discuss how a person sounds to himself or herself and to others, and how others may have different perceptions of the individual. **(Listening for content)**

Objective 13 Discuss in writing the procedure for handling interruptions with telephone customers.

- Read and discuss with students this section of the information sheet. **Listening for content, orally communicating a thought or idea)**

- Using a pair of cellular telephones, or a classroom telephone and another nearby telephone, assign pairs of students a list of technical information to discuss (catalog numbers etc.). Arrange for their conversations to be interrupted by another student, and practice the methods outlined in this unit for handling interruptions. **(Listening for content; orally communicating a thought or idea)**

Objective 14 List five items of information needed to complete a telephone order.

- Read and discuss with students the list of methods given in this section of the information sheet. **(Listening for content)**

- Hand out Assignment Sheet 5, "Take a Telephone Order," and review the introduction, directions, and evaluation criteria. Answer any questions then assign students a time to complete assignment. Refer to Teacher Supplement 2 for a sample customer order or create your own situation. Provide students with parts numbers and prices to coincide with assignment.

Objective 15 List three ways to use the telephone as a sales and advertising tool.

- Read and discuss with students this section of the information sheet. **(Listening for content; orally communicating a thought or idea)**

Suggested Activities

- Invite a salesperson from your local telephone company to visit your class to discuss telemarketing and telephone sales techniques. Involve class members in a discussion with this individual on how they have responded to various advertisements or telephone sales calls. **(Listening for content; critical thinking; orally communicating a thought or idea)**

Objective 16 Select true statements concerning other tips for intelligent telephone use.

- Read and discuss the material in this part of the information sheet. **(Listening for content)**

- Role play several telephone conversations involving communication of a large amount of technical information and several subjects. Hand out material to be covered in the telephone call to students and ask them to become familiar with it. After five minutes, collect the handouts from half of the students, but leave the handouts with the remainder of the class. Then, in role plays, demonstrate the need for writing one's self notes and keeping material of importance in front of yourself during the telephone call. **(Listening for content; oral communication; critical thinking)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."

- Give and evaluate the written test. See the component "Answers to Written Test."

- Evaluate the written-test and assignment-sheet scores on Unite Evaluation Form.

- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Buchanan, Robert D. *"Communicating With Employees,"* Food Service Marketing. 37

- Roan, Anthony J. *Training and Communication.* Part V. International Textbook Co.

Suggested Activities

Suggested Supplemental Resources

- Rowe, Kenneth L. and Jimerson, Hallie C. *Communications in Marketing*. Dallas, TX: Gregg Division/McGraw-Hill Book Co.
- *Win More Friends by Telephone*. American Telephone and Telegraph Co.
- *The Telephone is the Front Door to Your Business.* PM5102V a six-minute videotape dealing with the importance of telephone use and telephone techniques to improve customer relations in the parts industry. Briggs & Stratton Corp., P.O. Box 702, Milwaukee, WI 53201, 1993.
- *Making the Most of Yourself.*

  This 14-minute videotape focuses on two characters, one of whom is willing to take additional training, adjust his schedule, and keep his work up even when he is tired. The other character is not. The video emphasizes how body language, word choice, and tone of voice affect communication.
- *Say That One More Time.*

  This 14-minute videotape illustrates how to give directions and covers good and poor telephone skills. The film uses an employee's first day at work, learning how to use the copy machine, as an example of how to give and follow directions.
- *Telephone Communications Skills.*

  This 34-minute videotape illustrates how the telephone is the direct link to customers and others who call a business. The video shows how telephone courtesy—and discourtesy—can affect your institution's image.

  Note: The three 1983 videotapes listed above are in color on ½-inch VHS format. They are available to Oklahoma teachers from the Oklahoma Department of Vocational and Technical Education, 1500 West Seventh Avenue, Stillwater, Oklahoma 74074. Teachers in other states should order from the addresses listed on the next page.

Suggested Activities

Making the Most of Yourself; Say That One More Time. Agency for Instructional Technology, P.O. Box Z, Bloomington, Indiana 47420; phone: 800-457-4509.

Telephone Communications Skills. American Bankers Association, 1120 Connecticut Avenue NW, Washington, DC 20036; phone: 202-663-5000.

You're Not Listening!

In this 21-minute, 16-mm, color film produced in 1978, a Shakespearean actor leads viewers through a series of humorous and thought-provoking vignettes that illustrate techniques for building seven basic listening skills: eye contact, controlling one's mouth, becoming an observer, good thinking, not jumping to conclusions, avoiding prejudice, and working to keep an open mind.

This film is available from the University of Illinois Film Center, 1325 South Oak Street, Champaign, Illinois 61820. Telephone: 800-367-3456. Order number 56063. A rental fee is required.

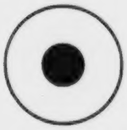
Work Communication Skills
Unit 3

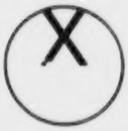
Answers to Assignment Sheets

Assignment Sheet 1—The content of the personal evaluation requested of the student should not be graded per se; this activity is to be used as a tool to help students identify any poor listening habits that they need to correct. Refer to criteria listed on assignment sheet to evaluate student performance.

Assignment Sheet 2—Student performance should be evaluated according to the criteria listed on the assignment sheet. Content may be evaluated using the following as a guide.

1. Yes
2. Hotel
3. No
4. 2, 7, 9, 5, 8
5. +
6. Nails
7. . .
8. No
9. (student's signature)
10.





Assignment Sheet 3—Student performance should be evaluated according to the criteria listed on the assignment sheet. Content may be evaluated using the following as a guide.

The student's name in the upper left-hand corner of the assignment sheet should be the only answer; the student answer sheet should be blank.

Assignment Sheet 4—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 5—Student performance should be evaluated according to the criteria listed on the assignment sheet.

Work Communication Skills
Unit 3

Answers to Written Test

1.

a.	9	e.	5	i.	3
b.	8	f.	11	j.	4
c.	1	g.	2	k.	6
d.	10	h.	7		

2. a. To inform
   b. To persuade
   c. To entertain

3. a. Information
   b. Way in which a message is conveyed to the receiver
   c. Person sending a message; the speaker or writer
   d. Person(s) to whom a message is directed
   e. Evaluation returned by the receiver of the message to the sender of the message

4. Answer should include any eight of the following:

   a. Big words and long sentences
   b. Technical terms and jargon
   c. Wordiness
   d. Generalities
   e. Boring, monotonous, or irritating tone or volume of voice
   f. Fast or slow rate of speech
   g. Poor listening skills
   h. Boring message or bored receiver
   i. Confusing terms and phrases
   j. Poor visibility
   k. Distractions
   l. Noise or poor hearing capabilities

5. a. Be as specific as possible.
   b. Use proper English.
   c. Pronounce words distinctly.
   d. Be sure terms are interpreted the same way by both the employee and the customer.

6. a, d, g, j, k, l, p

7.

a.	1	e.	3	i.	1
b.	4	f.	4	j.	3
c.	4	g.	1	k.	2
d.	1	h.	2	l.	1

Answers to Written Test

8. a. Never begin a task until you have read *all* of the directions.
b. Be sure that you understand the directions.
c. Ask for assistance or clarification as needed.

9.

a.	3	e.	2	i.	2
b.	4	f.	1	j.	3
c.	1	g.	4	k.	2
d.	2	h.	3	l.	1

10. a. Decide what you will write before you begin and make a *simple* outline.
c. Present you information in *logical* order.
f. Prune out *"deadwood"—trite, redundant,* and *unnecessary* words.
g. Write *legibly*, or type or input without errors.
i. Write *complete sentences* that are capitalized and punctuated correctly.
k. *Avoid* long sentences.
m. Fit your tone to your *audience*.

11. a. Best
b. Demonstrating
c. Receiver
d. Courteous
e. Legibly
f. Date
g. Copy
h. Reader

12. b, e, g, i, j, n, p, r, s

13. Answer should include the following:

a. Ask "Will you hold or shall I call you back?" when you must leave the line to get information.
b. Check back frequently to assure the customer he/she has not been forgotten if it becomes necessary to leave the telephone for long periods of time
c. Attract attention before resuming the call
d. Apologize for errors or delays

14. List should contain the following in any order:

a. Name and address of customer
b. Exact description of the item wanted
c. Quantity desired
d. Date and time of delivery
e. Billing instructions

Answers to Written Test

15. a. Advertise in the Yellow Pages.
    b. When customers call in, suggest related parts or tools for advertised specials.
    c. Phone frequent customers to let them know about store specials.

16. d

Work Communication Skills
Unit 3

Written Test

Name ______________________________ Score ______________

1. Match terms associated with work communication skills to their correct definitions. Write the numbers on the blanks.

_____a. Listening only to certain facts or details and missing the real meaning

_____b. Sending/receiving a visual message

_____c. Consists of the first letter of each word in a compound term

_____d. Informal, nonstandard vocabulary, often ungrammatical

_____e. Unofficial informal communication system that exists in all organizations; may be helpful or harmful depending on how it is used

_____f. Sending/receiving a written or spoken message

_____g. Gestures, facial expressions, and posture that convey a message

_____h. Receiving, processing, and evaluating both verbal and nonverbal communication

_____i. Exchange of information from one person to another through verbal and nonverbal messages

_____j. Something that prevents the receiver from receiving or understanding the message

_____k. Specialized vocabulary of those in the same work or profession

1. Acronym
2. Body language
3. Communication
4. Communication barrier
5. Grapevine
6. Jargon
7. Listening
8. Nonverbal communication
9. Selective hearing
10. Slang
11. Verbal communication

Written Test

2. State the purposes of communication.

a. ______________________________

b. ______________________________

c. ______________________________

3. Describe the essential elements of effective communication. Write your descriptions on the blanks provided beside each of the terms below.

a. Message: ______________________________
____

b. Medium: ______________________________
____

c. Sender: ______________________________
____

d. Receiver: ______________________________
____

e. Feedback: ______________________________
____

4. List eight common barriers to effective communication.

a. ______________ e. ______________

b. ______________ f. ______________

c. ______________ g. ______________

d. ______________ h. ______________

Written Test

5. List four factors necessary for communicating product information.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

6. Distinguish between examples of positive and negative body language. Write a "P" on the blanks before examples of positive body language.

______a. Frequent eye contact

______b. Clenched fist

______c. Drooping head and shoulders

______d. Smiling, pleasant facial expression

______e. Stiff, aggressive stance with arms raised and feet apart

______f. Yawning

______g. Relaxed, alert manner of standing or sitting

______h. Frowning facial expression with clenched teeth

______i. Raised eyebrows

______j. Head held high

______k. Shoulders upright

______l. Open palm, hands away from body

______m. Nail biting, pulling at hair or clothing

______n. Crossed arms

______o. Closed body

______p. Palms up, arms swinging freely

______q. Staring

Written Test

7. Complete guidelines for effective listening. Write the correct number on the blank provided before each item below.

______a. Listen with ______ to what the person has to say.

1. an open mind
2. skepticism
3. reservations
4. an ear for the facts

______b. Do not ______ or make assumptions.

1. jot down notes
2. block out distractions
3. defer judgement
4. draw hasty conclusions

______c. Listen for both verbal and ______ messages.

1. formal
2. oral
3. spoken
4. nonverbal

______d. Listen for ideas, ______, and intentions, as well as facts.

1. feelings
2. sarcasm
3. technical terms
4. colloquialisms

______e. Block out visual and auditory ______.

1. words
2. gestures
3. distractions
4. feedback

______f. Focus on the ______, not the ______.

1. speaker; message
2. medium; feedback
3. receiver; sender
4. message; speaker

Written Test

______g. Use ______ feedback to let the speaker know that he or she is being understood.

1. nonverbal
2. verbal
3. whole message
4. deferred

______h. Avoid ______ while you pretend to listen.

1. eye contact
2. letting your mind wander
3. giving feedback
4. taking notes

______i. Avoid ______ and talking.

1. interrupting
2. nonverbal feedback
3. paraphrasing
4. listening

______j. Avoid ______ responses.

1. honest
2. questioning
3. mentally rehearsing
4. body language

______k. When the speaker ______, repeat in your own words what the speaker said, and ask if that is what was meant.

1. is wrong
2. is finished
3. asks you
4. needs correction

______l. Jot down brief notes only if the message is ______.

1. long or complex
2. technical
3. brief and simple
4. giving instructions for a task

Written Test

8. Discuss in writing guidelines for following verbal and written directions in a work situation.

a. ______________________________

b. ______________________________

c. ______________________________

9. Complete guidelines for improving verbal communication. Write the correct number on the blank provided before each item below.

______ a. Accept responsibility for ______ communication.

1. formal
2. informal
3. effective
4. oral

______ b. Clarify your ideas and plan your approach ______ communicating.

1. while
2. after
3. when
4. before

______ c. Hold the receiver's attention through ______.

1. eye contact
2. proper enunciation
3. appropriate dress
4. hand gestures

______ d. Use ______ and direct language.

1. formal
2. simple
3. profound
4. technical

______ e. Be ______.

1. firm
2. brief
3. commanding
4. long-winded

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Written Test

_____f. Be interesting, accurate, and _____.

1. complete
2. firm
3. humble
4. technical

_____g. Reinforce words with actions and _____ that match your message.

1. a raised voice
2. an opinionated tone
3. eye contact
4. body language

_____h. Use a _____ tone of voice, and vary your _____ to avoid speaking in a monotone.

1. serious; body language
2. firm; words
3. pleasant; pitch
4. humorous; information

_____i. Avoid _____ mannerisms.

1. all
2. distracting
3. polite
4. clarifying

_____j. Avoid repeating _____ phrases.

1. prepositional
2. meaningful
3. empty
4. key

_____k. Obtain _____.

1. agreement
2. feedback
3. the audience's opinions
4. consensus

Written Test

______l. Listen ______.

1. actively
2. passively
3. intermittently
4. frequently

10. Correct *false* statements about guidelines for improving written communication. Write an "F" on the blank before each false statement in the following list. If the statement is false, rewrite it on the blanks provided to make it correct.

______a. Decide what you will write before you begin, and make a complex outline.

____

____

______b. Write a rough draft, and then check it and revise it according to the guidelines for good writing.

____

____

______c. Present your information in chronological order.

____

____

______d. Write exactly what you mean.

____

____

______e. Be brief and to the point.

____

____

Written Test

______ f. Prune out "greenwood"—precise, relevant, necessary words.

______ g. Write illegibly, or type or input without errors.

______ h. Spell all words correctly.

______ i. Write sentence fragments that are capitalized and punctuated correctly.

______ j. Be accurate; check all facts.

______ k. Use long sentences.

______ l. Use good, plain English.

Written Test

______m. Fit your tone to your mood.

____

____

______n. To make the information more accessible, use subject headings for long reports.

____

____

11. Complete guidelines for giving verbal and written directions in a work situation. Write the correct word(s) on the blank provided before each item below.

Verbal directions

__________a. When possible, decide who is (*not, best*) qualified for the task before assigning it.

__________b. State directions clearly and simply while (*telling, demonstrating*) how the task is to be done.

__________c. Be sure that the (*receiver, sender*) understands what, why, where, when, and how the task is to be done.

Written directions

__________d. Follow the five Cs of written communication. Make sure that your directions are clear, complete, concise, correct, and (*courteous, calculated*).

__________e. Write (*legibly, illegibly*), type, or input your directions on a computer.

__________f. Include the (*manager's name, date*) on the directions.

__________g. Make sure to keep a (*copy, record*) of all written directions.

__________h. Be sure that the (*writer, reader*) understands what, why, where, when, and how the task is to be done.

Written Test

12. Select from the following list guidelines for using the telephone correctly. Write an "X" on the blank before each correct guideline.

When answering a call

______a. Answer after the fourth ring.

______b. Use a pleasant voice.

______c. Identify your business but do not give your name.

______d. Speak distinctly into the receiver, which should be held about 3 inches from your mouth.

______e. Jot down the caller's name immediately and use it often.

______f. Ask, "Who is this?" if the caller does not identify himself or herself.

______g. When you must leave to get information, ask, "Will you hold, or shall I call you back?"

______h. When you place a caller on hold, play background music so the caller will have something to listen to while waiting.

______i. Apologize for errors or delays.

______j. Press the hold or mute button to cut out noise, and place the receiver where it will not fall when leaving the phone unattended.

______k. When transferring a call, tell the caller that you may lose him or her in the process and if so to call back.

When placing a call

______l. Plan your conversation while dialing.

______m. Let the phone ring no more than 5 times before hanging up.

______n. When the phone is answered, state your full name, the name of your business, and the reason for the call,

______o. Do not allow the caller to put you on hold if you are calling long distance.

______p. When you have completed the call, thank the other person for his or her assistance and hang up quietly.

Written Test

_______q. Remember ZIP Code numbers when placing your call.

_______r. Use the business' WATS line if it has one.

_______s. Do not use the business phone for personal calls unless you have been given permission to do so.

13. Discuss in writing the procedure for handling interruptions with telephone customers.

____

____

____

____

____

____

14. List five items of information needed to complete a telephone order.

a. ____________________________________

b. ____________________________________

c. ____________________________________

d. ____________________________________

e. ____________________________________

15. List three ways to use the telephone as a sales and advertising tool.

a. ____________________________________

b. ____________________________________

c. ____________________________________

Written Test

16. Select true statements concerning other tips for intelligent telephone use by placing an "X" in the appropriate blanks.

______ a. Do not waste time making notes before you place your call: once you get to talking you'll remember everything easily.

______ b. It is not necessary to tell someone you're calling long distance: people can usually distinguish a long-distance call from a local call.

______ c. Replace the telephone receiver so that it makes enough noise to let the other party know the conversation is over.

______ d. Keep emergency and frequently called phone numbers near the phone.

***Permission to duplicate this test is granted.**

Work Communication Skills
Unit 3

Unit Evaluation Form

Student Name ______________________________ Unit Rating ________

Assignment Sheet 1—Identify Your Listening Behaviors Rating ______

Comments: ____

____

Assignment Sheet 2—Follow Verbal Directions Rating ______

Comments: ____

____

Assignment Sheet 3—Follow Written Directions Rating ______

Comments: ____

____

Assignment Sheet 4—Give Verbal Directions While Demonstrating a Task Rating ______

Comments: ____

____

Assignment Sheet 5—Complete a Telephone Order Rating ______

Comments: ____

____

Unit Evaluation Form

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________________ Date __________

Student Signature ______________________________ Date __________

*Permission to duplicate this form is granted.

Work Communication Skills
Unit 3

Teacher Supplement 1—Listening Test Questions

These are the questions to ask students who will complete Assignment Sheet 2, "Follow Verbal Directions." The test combines the skills of listening and following directions. After each student is supplied with Assignment Sheet 2, read each instruction only once. Enunciate clearly and read slowly.

1. Write *yes* if your name begins with a vowel or consonant.
2. Of the words *cylinder* and *valve* pertaining to the parts specialist field, write the shorter.
3. Write *no* if you think that cement is heavier than feathers.
4. Write the numbers *2, 7, 9, 5,* and *8,* and circle the largest.
5. If you did not circle 8 make a plus sign; if you did, make a square.
6. If screwdrivers screw screws, complete this sentence correctly: *Hammers pound* ______.
7. If 3½ × 2 = 8, make a circle; if not, make two dots.
8. Provide the incorrect answer to this question: *Does wood come from trees?*
9. If Washington was not the first president of the United States, write the shorter of the words *red* and *green*; if he was, sign your name.

(*Instructor: Read Number 10 through entirely first, and then read it a sentence at a time as the students follow directions.*)

10. Draw two circles approximately the size of a dime side by side horizontally about 1 inch apart. Place an "X" in the right-hand circle, its top ends touching the top circumference and its bottom ends approximately centered in the circle. Draw a dot in the center of the left-hand circle approximately the size of the perforation in the three-hole page.

Work Communication Skills
Unit 3

Teacher Supplement 2—Sample Customer Order

Note: Use this supplement in conjunction with Assignment Sheet 5—Take a Customer Order.

Hello. This is Mr. Brown at EZ Repair Shop and I need brake parts for a 1990 Chevrolet Caprice as soon as possible. Charge them to our account.

Here's what I need.

Your Parts Supply

Order placed by Ed Brown Phone number 602-555-3875

Customer name EZ Repair Shop Date (Today's date)

Customer number 990 P.O. number 1636

Bill to: ____ New customer

Attn: Lena Gonzales

Business EZ Repair Shop

Street 1005 N. Street City Stillwater

State OK Zip code 74074

Ship/Deliver to: ____ Rush

Attn: Ed Brown

Business EZ Repair Shop

Street 1005 N. Street City Stillwater

State OK Zip code 74074

Special Instructions Rush! Deliver to service center.

Date shipped/delivered ____ **Time delivered** ____

Teacher Supplement 2

SHIP VIA	SLSM.	B/L NO.	TERMS	F.O.B. POINT
Local delivery	9033		Charge	Stillwater

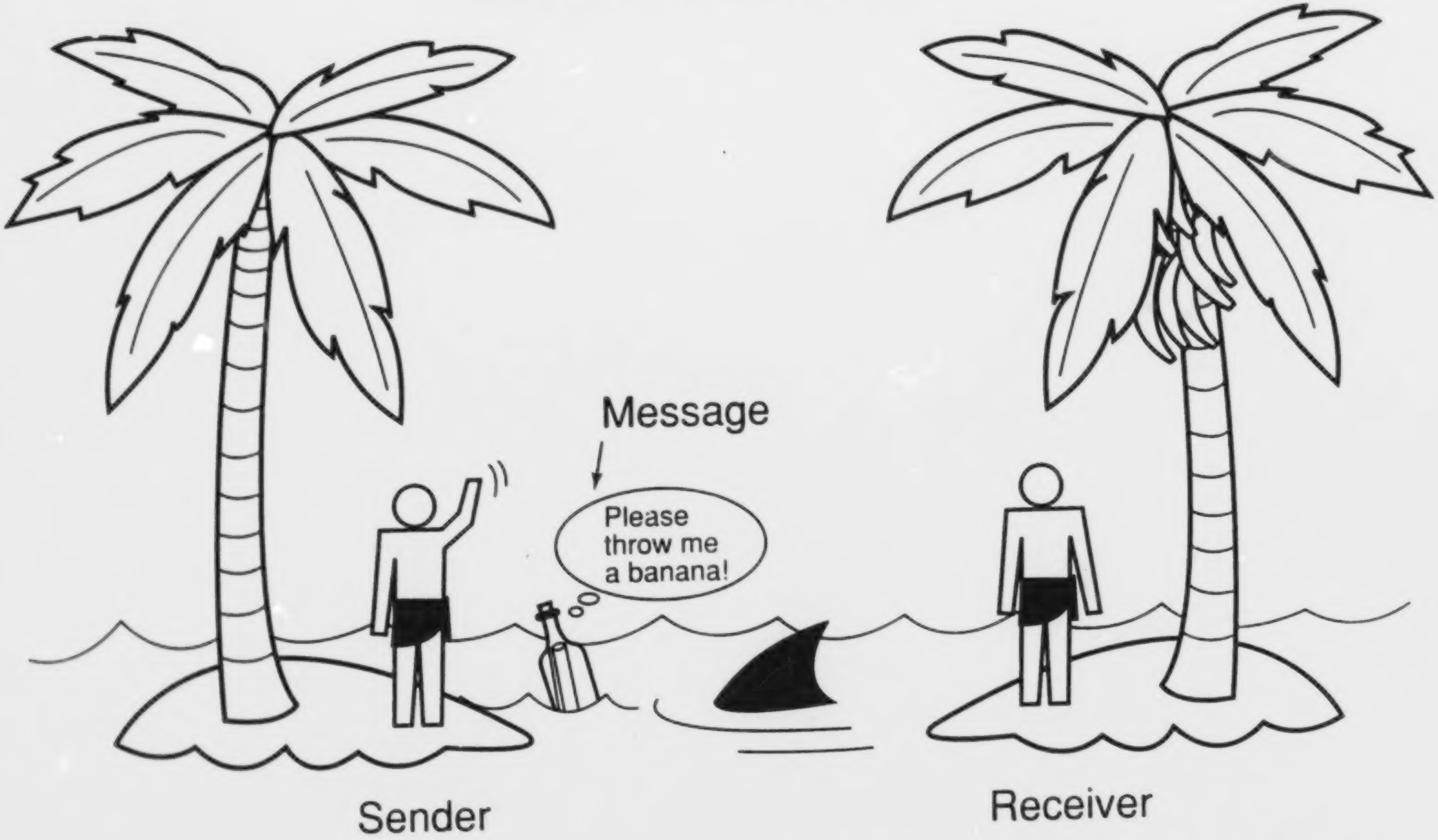
QUANTITY			PART NUMBER		DESCRIPTION	LIST	NET	AMOUNT
ORD.		B.O.						
1	1	0	12321457	154	PAD KIT	68.87	68.87	68.87
1	1	0	1154580	152	SHOE KIT*	45.68	45.68	45.68
2	2	0	3965092	164d	FRONT SEAL ASM	8.48	8.48	16.96
1	1	0	18012262		ADJUSTER REPAIR KIT	24.53	24.53	24.53
1	1	0	5466562		WHL CYL REPR KIT	15.07	15.07	15.07
1	1	0	554631	160	REAR SEAL ASM	10.83	10.83	10.83
1	1	0	1052535	210	HYD FLUID	6.35	6.35	6.35
1	1	0	1249146		REAR DRUM	96.92	96.92	96.92
					BRAKE PARTS FOR 1990 CHEVROLET CAPRICE			

20% RESTOCKING FEE ON ALL RETURNED PARTS. NO RETURN ON SPECIAL ORDERED OR ELECTRICAL PARTS. TEN DAY WAITING PERIOD ON ALL PARTS PAID BY CHECK.
HOURS MON-FRI 8 TO 5:30 SAT TILL NOON

CUSTOMER'S SIGNATURE

PARTS	285.21
SUBLET	
FREIGHT	0.00
SALES TAX	22.82
TOTAL	$308.03

Communication I


Message
Please throw me a banana!
Sender
Receiver

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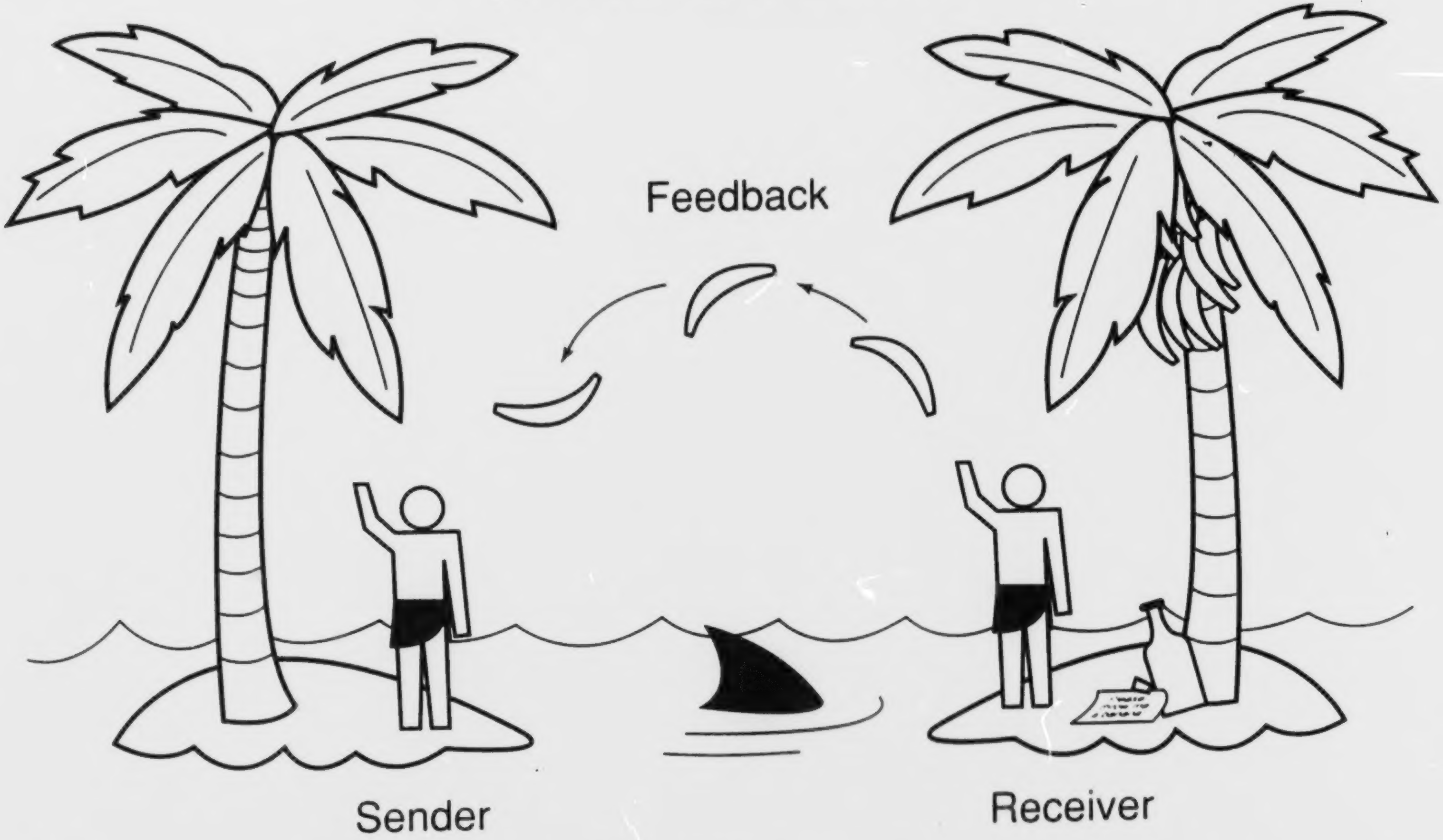
Communication II


Feedback
Sender
Receiver

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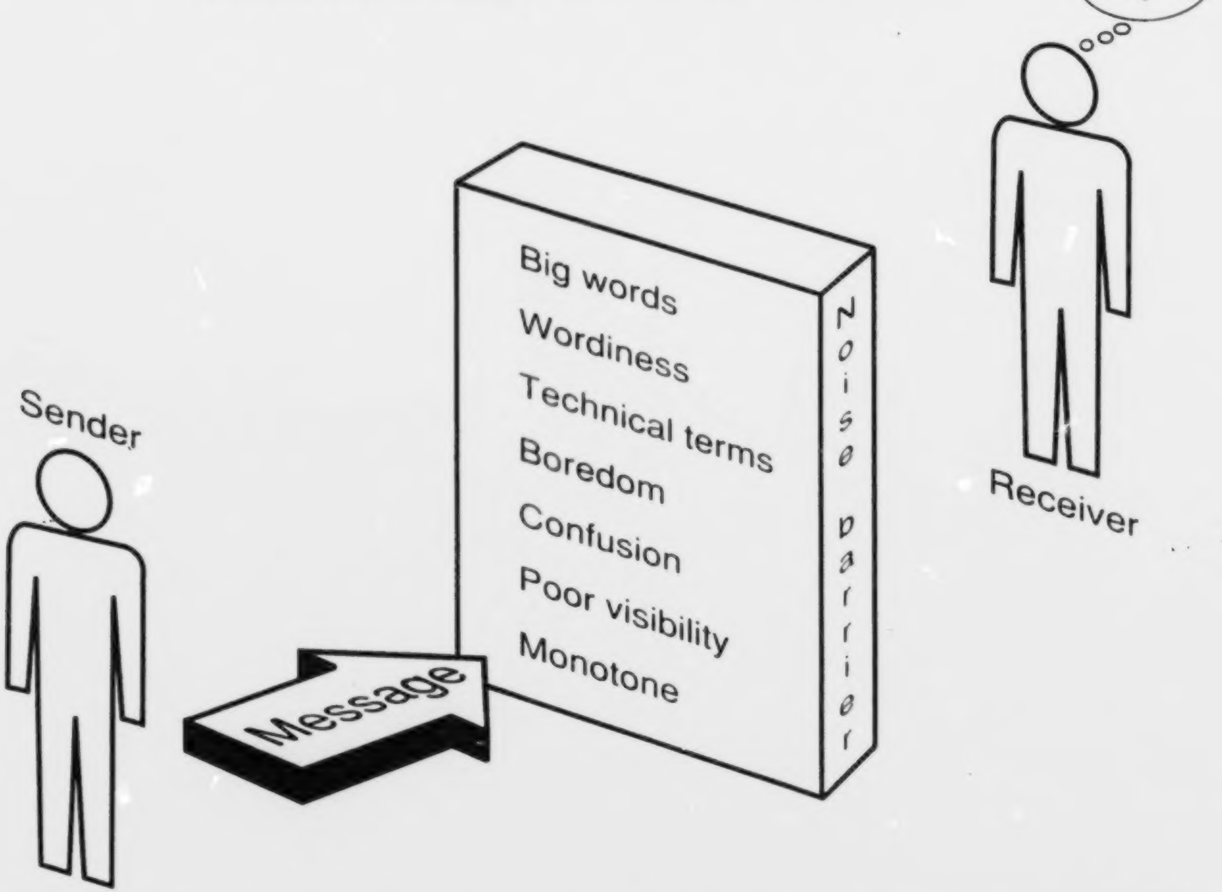
Teacher Page 39

TM 2

Communication Barriers



Sender

Message

Big words
Wordiness
Technical terms
Boredom
Confusion
Poor visibility
Monotone

Noise barrier

?

Receiver

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Work Communication Skills
Unit 3

Information Sheet

1. **Terms and definitions associated with work communication skills**

   a. **Acronym** — Consists of the first letter of each word in a compound term

   b. **Body language** — Gestures, facial expressions, and posture that convey a message

   c. **Communication** — Exchange of information from one person to another through verbal and nonverbal messages

   d. **Communication barrier** — Something that prevents the receiver from receiving or understanding the message

   Examples: Noise, distance, wordiness, technical terms, boredom, poor visibility or hearing, poor listening habits

   e. **Grapevine** — Unofficial informal communication system that exists in all organizations; may be helpful or harmful depending on how it is used

   f. **Jargon** — Specialized vocabulary of those in the same work or profession

   Example: Input the data interface to access the RAM.

   g. **Listening** — Receiving, processing, and evaluating both verbal and nonverbal communication

   h. **Nonverbal communication** — Sending/receiving a visual message

   Examples: Pictures, signs, symbols, facial expressions, body language

   i. **Selective hearing** — Listening only to certain facts or details and missing the real meaning

   Note: "Selective hearing" is sometimes defined as *hearing but not listening.*

   j. **Slang** — Informal, nonstandard vocabulary, often ungrammatical

   k. **Verbal communication** — Sending/receiving a written or spoken message

   Note: Most verbal communication also includes nonverbal communication in the form of body language and visual stimuli.

   Examples: Television, radio, books, speeches, conversation, audio and audiovisual tapes

Information Sheet

2. **Purposes of communication**

   a. To inform

   b. To persuade

   c. To entertain

3. **Essential elements of effective communication and their descriptions** (See Figures 1 and 2)

   a. **Message** — Information

   b. **Medium** — Way in which a message is conveyed to the receiver

   Note: The plural form of "medium" is "media."

   Examples: (*Verbal*) Written or spoken words in the form of letters, reports, speeches, and so on

   (*Nonverbal*) Signs, symbols, pictures, body language

   c. **Sender** — Person sending a message; the speaker or writer

   d. **Receiver** — Person(s) to whom a message is directed

   e. **Feedback** — Evaluation returned by the receiver of the message to the sender of the message

Information Sheet

Figure 1

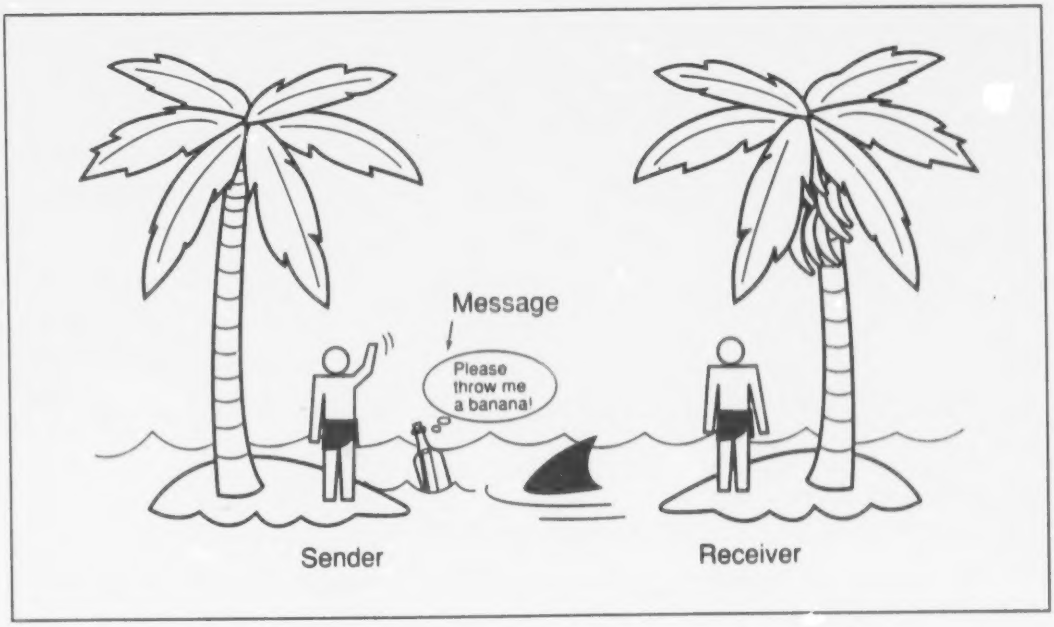
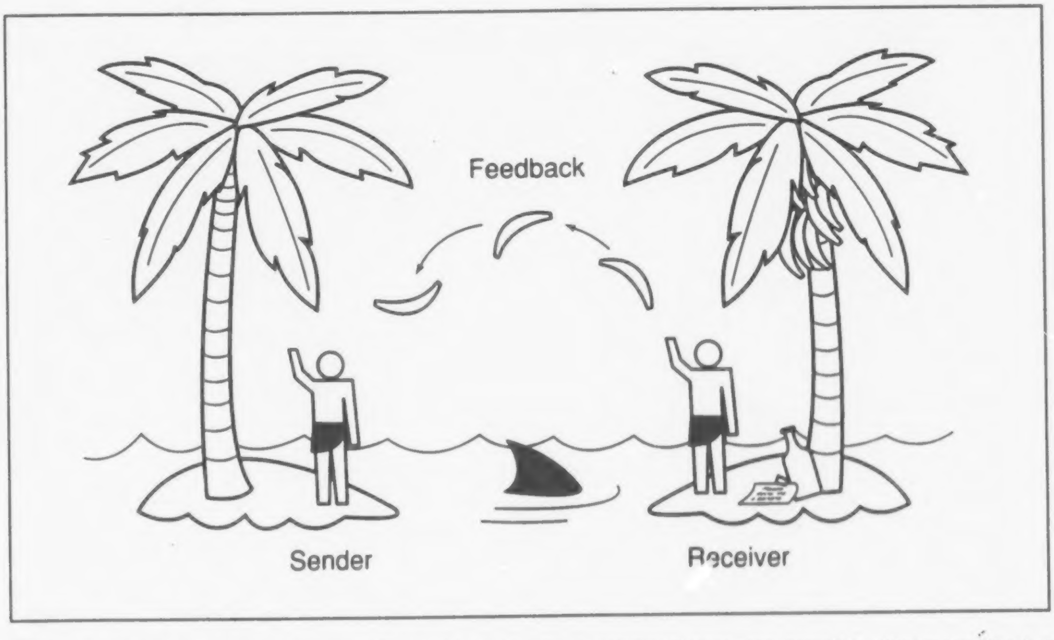

Message
Please throw me a banana!
Sender
Receiver

Figure 2


Feedback
Sender
Receiver

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Information Sheet

4. **Common barriers to effective communication**

   a. Big words and long sentences

   b. Technical terms and jargon

   c. Wordiness

   d. Generalities

   e. Boring, monotonous, or irritating tone or volume of voice

   f. Fast or slow rate of speech

   g. Poor listening skills

   h. Boring message or bored receiver

   i. Confusing terms and phrases

   Example: Foreign phrases

   j. Poor visibility

   k. Distractions

   l. Noise or poor hearing capabilities

5. **Factors necessary for communicating product information**

   a. Be as specific as possible.

   Note: Avoid jargon such as acronyms and technical terms that may not be understood by individuals outside parts profession.

   b. Use proper English.

   Note: Avoid slang.

   c. Pronounce words distinctly.

   d. Be sure terms are interpreted the same way by both the employee and the customer.

   Examples: Satisfaction guaranteed, best buy, rebuilt

Information Sheet

6. Examples of positive and negative body language

Note: Body language differs among nationalities and cultures and among social classes.

Example: Eye contact in one culture may indicate friendliness, and in another domination.

a. Examples of positive body language

- Open palm, hands away from the body, palms up, arms swinging freely
- Head held high, shoulders upright
- Relaxed, alert manner of standing or sitting
- Smiling, pleasant facial expression
- Frequent eye contact

  Note: Eye contact should be frequent but not total. In the American culture, staring is perceived as threatening or invasive.

b. Examples of negative body language

- Clenched fist, closed body, crossed arms
- Drooping head and shoulders
- Stiff, aggressive stance with arms raised and feet apart
- Frowning facial expression with clenched teeth
- Staring
- Yawning, nail biting, pulling at hair or clothing

  Note: These gestures are perceived as signs of fear or nervousness.

7. Guidelines for effective listening

a. **Defer judgement.**

- Listen with an open mind to what the person has to say.
- Do not draw hasty conclusions or make assumptions.

Information Sheet

b. **Listen for the whole message.**

- Listen for both verbal and nonverbal messages.
- Listen for ideas, feelings, and intentions, as well as facts.

  Note: This includes hearing things that are unpleasant or unwelcome.

c. **Pay attention.**

- Block out visual and auditory distractions.
- Focus on the message, not the speaker.
- Use nonverbal feedback (eye contact, head nods, smiles) to let the speaker know that he or she is being understood.

d. **Listen completely.**

- Avoid letting your mind wander while you pretend to listen.
- Avoid interrupting and talking.
- Avoid mentally rehearsing responses.

e. **Paraphrase what was heard.**

- When the speaker is finished, repeat in your own words what the speaker said, and ask if that is what was meant.

  Example: I think that I've got that. If I heard correctly, you would like me to compile last week's reservations in alphabetical order, make a copy of the list, give the list to the business office, and then file the reservations at the front desk.

- If the message is long or complex, jot down brief notes, and refer to them when paraphrasing or performing a task.

  Note: Notetaking is more of a memory aid than a listening aid. The danger in notetaking is becoming so involved in the writing process that you forget to listen to the whole message.

Information Sheet

8. Guidelines for following verbal and written directions in a work situation

a. Never begin a task until you have heard or read *all* of the directions.

b. Be sure that you understand the directions.

Note: If you receive verbal directions, restate them to the speaker to ensure that you understand him or her correctly. Or, when the speaker has finished, jot down the main points and steps as you remember them, and verify these with the speaker.

c. Ask for assistance or clarification as needed.

Note: It is better to ask for assistance than to perform a task incorrectly. This not only causes extra time needed to do the task over, but may cause unnecessary costs in equipment and supplies, goods, or money.

9. Guidelines for improving verbal communication

a. Accept responsibility for effective communication.

b. Clarify your ideas and plan your approach before communicating.

c. Put yourself in the receiver's position.

d. Get the receiver's attention before delivering the message.

e. Hold the receiver's attention through eye contact.

f. Use simple and direct language.

g. Be brief.

h. Be interesting, accurate, and complete.

i. Reinforce words with actions and body language that match your message.

j. Use a pleasant tone of voice, and vary your pitch to avoid speaking in a monotone.

k. Avoid distracting mannerisms.

Examples: Twirling your hair, playing with jewelry, playing with a scrap of paper or paperclip, rubbing your eyes, adjusting your clothes, yawning excessively

Information Sheet

l. Avoid repeating empty phrases.

Examples: *Like* the linen supply was late in arriving, *you know?* and I had four suites to make up *and everything*. *Okay*, so what am I going to do? *Personally*, I think we should change our linen supplier, *you know?*

m. Obtain feedback.

Examples: — Ask questions.

— Ask the receiver to repeat the message.

— Ask the receiver to demonstrate understanding.

— Observe the receiver's body language.

n. Listen actively.

10. Guidelines for improving written communication

a. Decide what you will write before you begin, and make a simple outline.

b. Write a rough draft, and then check it and revise it according to the guidelines for good writing.

c. Present your information in a logical order.

d. Write exactly what you mean.

Note: The reader cannot ask questions, so do not use five words if twenty are needed.

e. Be brief and to the point.

Note: Do not use twenty words when you can say it in five.

f. Prune out "deadwood"—trite, redundant, unnecessary words.

Example: (*Unpruned*) Due to the fact that we are actually faced with a shortage of sheets of paper at this point in time, we, therefore have decided among ourselves to recycle the sheets of paper used in our computers.

(*Pruned*) Because we now face a paper shortage, we have decided to recycle used computer paper.

Information Sheet

g. Write legibly, or type or input without errors.

h. Spell all words correctly.

Note: Use your dictionary or your computer's spelling checker.

i. Write complete sentences that are capitalized and punctuated correctly.

j. Be accurate; check all facts.

k. Avoid long sentences.

l. Use good, plain English.

Example: (*Overwrought*) An imprudent man rarely, if ever, has the innate capacity and intellectual wherewithal to retain for a sustained period of time the profusion of currency that fate has, in all of her bountiful generosity, heaped upon him.

(*Plain English*) A fool and his money are soon parted.

m. Fit your tone to your audience.

Example: A letter to a customer will have a different tone than one to a co-worker.

n. To make the information more accessible, use subject headings for long reports.

11. Guidelines for giving verbal and written directions in a work situation

a. **Verbal directions**

Note: To avoid misunderstanding or resistance, always explain the reasons for doing something.

- When possible, decide who is best qualified for the task before assigning it.
- State directions clearly and simply while demonstrating how the task is to be done.
- Be sure that the receiver understands

—*What* is to be done.
—*Why* it is to be done.
—*Where* it is to be done.
—*When* it is to be done.
—*How* it is to be done.

Information Sheet

b. **Written directions**

- Follow the five Cs of written communication. Make sure that your directions are
  - — Clear
  - — Complete
  - — Concise
  - — Correct
  - — Courteous
- Write legibly, type, or input your directions on a computer.
- Include the date on the directions.
- Make sure to keep a copy of all written directions.
- Be sure that the reader understands
  - — *What* is to be done.
  - — *Why* it is to be done.
  - — *Where* it is to be done.
  - — *When* it is to be done.
  - — *How* it is to be done.

12. Guidelines for using the telephone correctly

Note: Remember when you are on a business telephone, you represent the entire business. The business telephone is usually one of the most important sales tools in an establishment selling automotive and industrial engine parts. Those who make their living in the parts business agree the business is only as effective as the telephone skills of its parts specialists.

a. **When answering a call**

- Answer promptly.
- Use a pleasant voice.
- Identify yourself and your business.

  Example: "Joe's Auto Supply, this is Debbie Smith. How may I help you?"
- Speak distinctly into the receiver, which should be held about 1 inch from your mouth.

Information Sheet

- Jot down the caller's name immediately and use it often.
- Be friendly and unrushed.

  Note: Do not ask who is calling unless it is company policy.
- Use the correct method when leaving the phone unattended.

  Note: A telephone receiver can pick up sound for 10 to 12 feet. In a parts business, many items have different prices depending upon what level (jobber, do-it-yourselfer, dealer, or fleet mechanic) the customer is classified. If a customer waiting on the other end of the telephone line hears discussion of various prices or other casual conversation in the store, it is possible for he or she to become angry to discover the price quoted over the phone might be higher than one given to someone else on the identical item. Also, other conversation overheard accidentally can be taken out of context and be the cause for hard feelings and lost customers.

  — Press the hold or mute button to cut out noise.
  — Place the receiver where it will not fall.
- When transferring a call, tell the caller why the call is being transferred and give the caller the extension number and the name of the party in case the call is disconnected.

  Example: "Let me transfer you to extension 356, Larry Wilson in automotive. He will be able to answer your questions."

b. **When placing a call**

- Plan your conversation before calling.
- Let the phone ring 7 to 10 times before hanging up.
- When the phone is answered, state your full name, the name of your business, and the reason for the call.

  Example: "Hello, this is Lisa O'Dell from O'Dell's Parts Supply. I'm calling to let you know your new seat covers have been received. You can pick them up at your convenience."
- State, "This is a long-distance call," if you are calling directly.
- When you have completed the call, thank the other person for his or her assistance and hang up quietly.

Information Sheet

- Remember time-zone differences when placing your call.
- Use the business' WATS line if it has one.

  Note: WATS, or Wide Area Telephone Service, is a service the business pays for. If you direct dial, you may be costing the business money.
- Do not use the business phone for personal calls unless you have been given permission to do so.

13. Procedure for handling interruptions with telephone customers

a. Ask "Will you hold or shall I call you back?" when you must leave the line to get information.

b. Check back frequently to assure the customer he/she has not been forgotten if it becomes necessary to leave the telephone for long periods of time.

c. Attract attention before resuming the call.

Example: "Mrs. Chen? Thank you for waiting."

d. Apologize for errors or delays.

14. Items of information needed to complete a telephone order

a. Name and address of the customer

Note: When possible, put the customer's order directly on the computer and note time order taken. This can save time, especially on long orders.

b. Exact description of the item wanted

c. Quantity desired

d. Date and time of delivery

e. Billing instructions

Note: Be sure to confirm the price of each item. If it is to be a charge sale, the customer should give a purchase order number which the salesperson should verify before releasing the order. If the customer has any questions that the salesperson cannot answer, the salesperson should obtain the information immediately or else offer to call the customer back with the information.

Information Sheet

15. Ways to use the telephone as a sales and advertising tool

a. Advertise in the Yellow Pages.

Note: Some parts stores advertise exclusively in the Yellow Pages.

b. When customers call in, suggest related parts or tools for advertised specials.

c. Phone frequent customers to let them know about store specials.

Note: Keep a log on frequent customers and note what parts and tools they have ordered in the past and any specialty items that they might be interested in.

16. Other tips for intelligent telephone use

a. Write down points to be covered and questions to be asked before placing a call, especially a long distance call

b. Note where you are calling from as part of your introduction as soon as the party answers

Example: "Hello, this is Maria Chavez with Joe's Auto Supply in Denver, Colorado. May I talk to Mr. Jones?"

Note: Consequently, the party who answers should not keep you waiting for a long period.

c. Replace the telephone receiver easily.

Note: The person making the call should hang up first.

d. Keep emergency and frequently called phone numbers near the phone.

Note: Many stores call their frequent and best customers prior to making a delivery run; this courtesy often brings additional sales and saves a lot of money on single-item deliveries.

Work Communication Skills
Unit 3

Student Supplement 1—Guidelines for Giving a Demonstration Talk

The key to giving a demonstration is being prepared. You should gather all needed equipment and materials, order and practice the steps in the procedure so that you can demonstrate them smoothly, and plan what you are going to say. Rehearse your presentation several times before giving it. Follow the guidelines below to prepare and complete the demonstration talk in Assignment Sheet 4, "Give Verbal Directions While Demonstrating a Task."

Guidelines for giving a demonstration talk

1. Gather all needed equipment and materials.
2. Place the equipment and materials within easy reach and in view of the person or persons you are instructing.
3. Speak clearly and with inflection.
4. Relate the steps in the correct order.
5. Know the process you are demonstrating so that you can supply complete information and all technical terms and sequences. Do not stumble over names of parts or the basic operation of the object or task.
6. Show the object, part, or steps being demonstrated to the person(s) you are instructing, holding the object or part up or giving it to the individual for close inspection if necessary.
7. Anticipate questions and be prepared to answer them.
8. Rehearse, rehearse, rehearse, even if you think that you know the process well. It is more complex to demonstrate and explain a process than it is to perform it yourself.

Work Communication Skills
Unit 3

Student Supplement 2—Analyze Voice Quality

Name ______________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	______
Evaluation was scored correctly	______

Directions: Do a tape recording of your voice. Then, listen to the tape and complete the rating which follows. Using the rating of your voice on tape, prepare a list of ways in which you can improve your voice. Complete the list on a separate piece of paper. Repeat exercise several times to determine any noticeable progress.

Voice Rating

When the answer to any of the following questions is "yes," put down a minus four. If it is "maybe" or "sometimes," put down a minus two. If it is "no," put down zero. Of course, the lower the numerical score the fewer voice faults you have. A score of 0 to -10 is excellent; -10 to -20 is good; -20 to -30 is fair; and -30 and below is unsatisfactory.

	Answer			Score
	Yes	Maybe/Sometimes	No	
1. Do you speak too loudly or in a noisy manner?				
2. Do people frequently ask you to repeat a statement				
3. Do you speak in the same tone continually?				
4. Do you speak with the same volume continually?				
5. Do you speak in an artificial, unnatural, and affected voice?				
6. Is your voice high pitched and shrill?				
7. Do you frequently speak with lungs almost empty?				

Student Supplement 2

		Answer			Score
		Yes	Maybe/Sometimes	No	
8.	Do you speak in long sentences which frequently lose their meaning?				
9.	Do you hiss when using certain letters? (P, B, T, C, S)				
10.	Do you speak in mush tones as though you had something in your mouth?				
11.	Do you use "uh" and "er-uh" frequently?				
12.	Is your voice clouded and husky?				
13.	Do you talk "through your nose"?				
14.	Do you talk in a jerky manner?				
15.	Do you talk in a whining and apologetic manner?				
16.	Do you talk in a dominating, dictatorial tone?				
17.	Do you stammer and stutter?				
18.	Do you often speak too fast or in a slow drawl?				
19.	Do you mispronounce words frequently?				
20.	Does your voice lose its force and expression at the end of sentences?				
21.	Do you speak in a flat, dull and colorless tone?				
22.	Do you jumble up consonants, which make your speech hard to understand?				
23.	Do you use a "gushy" or "gooey" voice when talking to friends?				
24.	Do you choke off vowel sounds?				
25.	Is your voice unpleasant when you laugh?				
26.	Do you put the "d," "t," and "ing" on the end of words?				
27.	Do you run words together?				
28.	Do you use colloquialisms or speak with an accent?				
29.	Do you have an adequate vocabulary?				
30.	Do your words flow out evenly and clearly?				
31.	Is your voice friendly and cordial?				
32.	Can you be heard clearly in the back of the room when speaking?				
33.	Do you emphasize your main thought?				

Work Communication Skills
Unit 3

Assignment Sheet 1—Identify Your Listening Behaviors

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Questions were answered completely	______
Evaluation was scored correctly	______

Introduction: A good listener participates actively and is interested and knowledgeable. Personnel in the service-oriented parts specialist profession especially need to develop their listening skills. Providing customers with excellent service should be the primary goal of all parts specialists. And, satisfying customers' needs requires that the employee listen actively and be aware of the customers' tone of voice, hand gestures, and other body language.

Most people spend more time listening than they spend on any other communication activity, yet a large percentage of people never learn to listen well. One reason for this is that they develop poor listening habits that continue with them throughout life.

One way you can improve your listening skills is to identify your poor listening habits and make an effort to change them.

Directions: Review guidelines for effective listening in Objective 7 of the information sheet. Then answer the following ten questions about your listening habits. Answer honestly by placing a check in the box under "Often," "Sometimes," or "Seldom." Check page 62 for an analysis of your scores.

		Often	Sometimes	Seldom
1.	It is said that you think four times faster than the person talking to you. Do you use this excess time to turn your thoughts elsewhere while you keep general track of the conversation?	☐	☐	☐
2.	When someone is speaking, do you listen primarily for the facts rather than the ideas?	☐	☐	☐
3.	Do certain words, phrases, or ideas so prejudice you against the speaker that you cannot listen objectively to what is being said?	☐	☐	☐

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Assignment Sheet 1

		Often	Sometimes	Seldom
4.	When you are puzzled or annoyed by what someone says, do you try to straighten out the matter immediately—either in your own mind or by interrupting the speaker?	☐	☐	☐
5.	If you feel that it would take too much time and effort to understand or undertake something, do you go out of your way to avoid hearing about it?	☐	☐	☐
6.	Do you deliberately turn your thoughts to other subjects when you think that the speaker has nothing interesting to say?	☐	☐	☐
7.	Can you tell by a person's appearance and delivery that he or she will have nothing worthwhile to say?	☐	☐	☐
8.	When someone is talking to you, do you try to make him or her think you are paying attention when you are not?	☐	☐	☐
9.	When you are listening to someone, are you easily distracted by outside sights and sounds or by the speaker's appearance or dress?	☐	☐	☐
10.	If you want to remember what someone is saying, do you try to repeat key points and phrases under your breath or in your head as the speaker goes along?	☐	☐	☐

Score Analysis

If you scored 7 or more in the "Seldom" column, you are generally an excellent listener. Work on those three or so that you scored "often" or "sometimes."

If you scored 7 or more in the "Sometimes" column, you are generally a good listener but need to practice your listening skills more consistently for improvement.

If you scored 4 or more in the "Often" column, you have poor listening habits. Look at the questions you checked "often." What poor listening habits do they describe? The first step to good listening is to recognize your poor listening habits. Then you must work to improve your listening skills.

Work Communication Skills
Unit 3

Assignment Sheet 2—Follow Verbal Directions

Name ________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Did not talk during the exercise	_____
Followed directions	_____
Answered a minimum of 7 of 10 questions correctly	_____

Introduction: This assignment is designed to determine how well you listen and follow verbal directions. Some of the questions your instructor will read are nonsense, but they are a good test of your listening ability.

Directions: Your instructor will read a list of ten items. He or she will read each item but the last only once, pausing briefly for you to follow directions. The last question will be read through once, and then reread a sentence at a time.

Listen carefully, and then write the requested information after the appropriate numbers below, and follow the directions as they are read. You should not talk to your classmates or ask questions during this assignment.

1.

2.

3.

4.

5.

6.

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Assignment Sheet 2

7.

8.

9.

10.

Work Communication Skills
Unit 3

Assignment Sheet 3—Follow Written Directions

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Did not talk during the exercise	______
Followed directions	______
Completed assignment within five-minute time period	______

Introduction: Following instructions properly can save you frustration, time, and money—both on and off the job. In many cases, following directions also protects you from the hazards of performing a task or job in an unsafe manner. This assignment is designed to determine how well you read and follow written directions.

Directions: Your instructor will give you five minutes to complete the following assignment. Do not begin until your instructor tells you to do so. Then follow the directions below. Write your answers on a separate sheet of paper.

1. Write your name in the upper left-hand corner of the assignment sheet.

2. Read all directions.

3. Number a separate sheet of notebook paper from 1 to 10, leaving three blank lines between each number.

4. Draw five small triangles beside the number 1 on your answer paper.

5. Put an "X" in each triangle beside number 1.

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Assignment Sheet 3

6. Draw a circle around the number 2 on your assignment sheet.

7. Count the number of pages in Chapter 3 of any book you have with you now, and write the total beside number 3 on your answer sheet.

8. Multiply your answer by your age at your next birthday.

9. Write the name of one U.S. president beside answer sheet number 9.

10. Beside number 4, write today's date.

11. Beside number 5, print the city and state you were born in.

12. Count the number of persons in the room and write the answer beside number 6 on your answer sheet.

13. Say aloud, "I have reached number 13, and I am following directions."

14. Now that you have completed the reading, omit all directions except the first two.

Work Communication Skills
Unit 3

Assignment Sheet 4—Give Verbal Directions While Demonstrating a Task

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
All needed equipment and materials were at hand	______
Positioned self so that audience could see demonstration	______
Spoke clearly and with inflection	______
Knew the object or process well and could supply all needed terms or sequences	______
Could answer all questions asked by the learner	______
Presentation was well prepared and smooth	______

Introduction: Giving verbal directions while demonstrating a process is a skill that requires both planning and logic. If you have ever tried to show someone how to use a calculator, use a computer, take an order, or even something as simple as answering the phone, you know how difficult it is to explain and demonstrate even those simple processes that come effortlessly to you.

Employees are often asked to show new co-workers how to perform their job tasks, and supervisors must train new employees on the processes and equipment used in the business. There will also be times when a customer requests directions concerning the procedure for identifying, removing, or installing a part.

Directions: Choose from the list on the following page a process that you know well, or choose another process with your instructor's permission. Use Student Supplement 1, "Guidelines for Giving a Demonstration Talk," to assist you in preparing your demonstration talk, and then present your explanation/demonstration to the class or selected class member(s) on a date scheduled by your instructor.

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Assignment Sheet 4

How to—

- Operate a business telephone (placing callers on hold, transferring callers, dialing "inside" and "outside" numbers, using the WATS line, and so on).
- Use a business copier to make single- and double-sided pages, enlarge and reduce images, position paper on glass.
- Load paper and toner, or correct a paper jam in a business copier
- Alphabetize and file a series of invoices.
- Use a calculator.
- Take a phone order.
- Set up a product display.
- Pick up and carry several boxes safely.
- Assist a customer in locating a part.
- Use a computer for a specific task (inputting information on a form, moving text, creating columns, and so forth).
- Set up a cash drawer, or make a credit-card transaction.
- Use a Fax machine.

Work Communication Skills
Unit 3

Assignment Sheet 5—Take a Telephone Order

Name ______________________ Overall Rating ____________

Evaluation criteria	Rating
Directions have been followed	______
Key information was read back and confirmed	______
Order was accurately taken	______

Introduction: Taking an accurate phone order saves time and money. A parts specialist must learn to listen for content, and be able to accurately record specific information concerning an order on paper or directly in the computer.

When taking a phone order, read back important information such as customer numbers, quantities, and exact descriptions of items needed. It is also wise to confirm the price of each item with the customer.

In this assignment, you will take a telephone order to evaluate your listening and oral and written communication skills.

Directions: When you are ready to complete this assignment, your instructor will role play as a customer and call in an order for various parts and supplies. Record the necessary information on either the form provided in this assignment or on the computer (as designated by your instructor). Ask questions that may be needed to clarify information, and remember to confirm the order and prices with the customer.

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Assignment Sheet 5

Your Parts Supply

Order placed by ______________________ Phone number ____________

Customer name ______________________________ Date __________

Customer number ____________________ P.O. number ______________

Bill to: ____ New customer

Attn: ______________________________

Business ______________________________

Street ______________________ City ____________

State ______________________ Zip code __________

Ship/Deliver to: ____ Rush

Attn: ______________________________

Business ______________________________

Street ______________________ City ____________

State ______________________ Zip code __________

Special Instructions ______________________________

____

Date shipped/delivered ____________________ **Time delivered** ________

Part Number	Description	Quantity	Unit Price	Total Price

Tax ____________

Total ____________

Basic Workplace Safety and First-Aid Skills
Unit 4

Objective Sheet

Unit Objective

After completing this unit, the student should be able to apply basic workplace safety and first-aid skills. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 100 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to basic workplace safety and first-aid skills with their correct definitions.
2. Select true statements concerning rules for personal safety.
3. Select true statements concerning guidelines for maintaining a safe work environment.
4. Complete a list of guidelines for lifting and moving items safely.
5. List rules for using ladders safely.
6. Select true statements concerning rules for hazardous material safety.
7. Select true statements concerning purposes of material safety data sheets.
8. List three ways hazardous materials can enter the body.
9. Match classes of fires with their definitions.
10. Match types of fire extinguishers with the classes of fires for which they were designed.
11. Select true statements concerning OSHA regulations for battery safety.
12. List general rules of battery safety.
13. Match potential battery hazards with ways to avoid them.
14. List personal safety rules for working with batteries.
15. Solve a problem concerning first-aid procedures for personal acid splashes.

Objective Sheet

16. Solve a problem concerning emergency procedures for acid-spills on floors and equipment.
17. Solve problems concerning first-aid procedures for cuts and scrapes.
18. List safety rules concerning flammable liquids.
19. List housekeeping procedures for warehouses and stockrooms.
20. Select true statements concerning housekeeping procedures for counter and display areas.
21. Complete a safety inspection. (Assignment Sheet 1)
22. Interpret material safety data sheets. (Assignment Sheet 2)
23. Analyze scenarios to determine appropriate safety practices. (Assignment Sheet 3)
24. Lift a heavy object properly. (Job Sheet 1)
25. Place and climb a ladder safely. (Job Sheet 2)

Basic Workplace Safety and First-Aid Skills
Unit 4

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Obtain films, videotapes,and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Arrange for a local safety specialist to visit the class to discuss this unit's safety rules and recommendations.
- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the unit introduction and teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms related to basic workplace safety and first-aid skills to their correct definitions.

- Read and discuss with students the terms and definitions presented in this section of the information sheet. **(Reading/listening for content)**

Objective 2 Select true statements concerning rules for personal safety. **Objective 3** Select true statements concerning guidelines for maintaining a safe work environment.

- Hand out Assignment Sheet 1, "Complete Safety Inspection," and discuss introduction and directions with students. When students have completed assignment, let them discuss what they observed in shop area and other parts of store. **(Reading/listening for content; orally communicating a thought or idea)**

Objective 4 Complete a list of guidelines for lifting and moving items safely.

- Find and quote statistics that show the lost work time per year that results from improper lifting.
- Show students accident reports that reflect how improper practices have lead to actual accidents in the workplace. **(Listening for content; adapting to the organizations goals and values)**
- Discuss with students proper lifting techniques using Transparencies 1 and 2, "How to Lift Safely" to help illustrate your discussion. **(Listening for content)**
- Hand out Job Sheet 1, "Lift a Heavy Object Properly." Demonstrate proper lifting techniques, following the steps in the job sheet. Answer any questions, then have students complete Job Sheet 1. **(Listening for content and directions)**

Suggested Activities

Objective 5 List rules for using ladders safely.

- Use an actual ladder to point out the parts of a ladder mentioned in the objective and demonstrate procedures for safely carrying, placing, heeling, climbing, and descending a ladder. Have students take notes on the major points during demonstration. Discuss these notes with students. **(Listening for content; applying technical terms; writing)**

- Hand out Job Sheet 2, "Place and Climb a Ladder Safely." Read with students the note and the introduction to the job sheet. Demonstrate the proper procedure for placing and climbing a ladder safely. Allow each student to return your demonstration. Assign two-person teams and have students complete the job sheet. **(Listening for content and directions)**

Objective 6 Select true statements concerning rules for hazardous materials safety.

- Read and discuss with the students the factors presented in this section of the information sheet. **(Reading/listening for content; orally communicating a thought or idea)**

Objective 7 Select true statements concerning purposes of material safety data sheets (MSDS).

- Hand out Student Supplement 1, "Guidelines For Interpreting Material Safety Data Sheets," and discuss with the class its contents. **(Reading/listening for content)**

- Hand out Assignment Sheet 2, "Interpret Material Safety Data Sheets." Show students examples in class. Review introduction and directions. Have students turn in completed assignment for evaluation. **(Reading; communicating a thought or idea in written form)**

Objective 8 List ways hazardous materials can enter the body.

- Read and discuss with the students the various ways hazardous materials can enter the body. Arrange for a local safety expert to discuss this with the class and ask students for a written report on the class discussion. **(Reading/listening for content; orally communicating a thought or idea)**

Suggested Activities

Objective 9 Match classes of fires with their definitions. **Objective 10** Match types of fire extinguishers with the classes of fires for which they were designed.

- Hand out Student Supplement 2, "Using Portable Fire Extinguishers." Read and discuss the material, emphasizing the symbols and their meanings. Ask students to give examples of various classes of fires. **(Reading/listening for content; orally communicating a thought or idea)**

- Arrange for a local fire fighter to address the class and demonstrate the various types of fire extinguishers on actual fires. Allow students to use the different fire extinguishers to familiarize themselves with the tools. **(Listening for content; applying technical terms; adapting to the organization's goals and values)**

Objective 11 Select true statements concerning OSHA regulations for battery safety. **Objective 12** List general rules for battery safety. **Objective 13** Match potential battery hazards with ways to avoid them. **Objective 14** List personal safety rules for working with batteries.

- Read and discuss the various factors and rules listed in these sections of the information sheet. **(Listening for content; orally communicating a thought or idea)**

- Invite a chemistry teacher to address the class and demonstrate the effects of sulfuric acid on clothing and various common materials. In addition, a class demonstration on the flammability of hydrogen can be discussed and demonstrated at this time with proper precautions.

Objective 15 Solve a problem concerning first aid procedures for personal acid splashes. **Objective 16** Solve a problem concerning emergency procedures for acid spills on floors and equipment.

- Read and discuss the topics listed in these sections of the information sheet, taking time to emphasize the need for this knowledge. **(Listening; reading for content)**

Suggested Activities

Objective 17 Solve problems concerning first-aid procedures for cuts and scrapes.

- Read and discuss with the students safety procedures for treating cuts and scrapes. Emphasize the importance of following safety procedures in the workplace. **(Listening; reading for content)**
- Hand out Student Supplement 3, "Fact Sheet on Blood-Borne Pathogens." Have students read the material, then discuss the use of protective measures and equipment. **(Reading; listening for content; orally communicating a thought or idea)**

Objective 18 List safety rules concerning flammable liquids. **Objective 19** List housekeeping procedures for warehouses and stock room. **Objective 20** Select true statements concerning housekeeping procedures for counters and display areas.

- Read and discuss with students these sections of the information sheet. **(Listening for content; orally communicating a thought or idea)**
- Hand out Assignment Sheet 3, "Analyze Scenarios to Determine Appropriate Safety Practices." Review the introduction and directions with students. Have students turn in completed assignment for evaluation. **(Reading; critical thinking)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job sheet scores on Unit Evaluation Form.
- Reteach and retest as required.

Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- *Automotive Wholesaler Counterman's Handbook.* Chicago, IL: Automotive Service Industry Association.
- *Kidde Portable Extinguishers, The ABC's of Fire Protection.* Belleville, NJ: Walter Kidde & Co., Inc.
- *Occupational Exposure to Bloodborne Pathogens.* Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C., 1992.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.
- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Basic Workplace Safety and First-Aid Skills
Unit 4

Answers to Assignment Sheets

Assignment Sheet 1—Student performance should be evaluated according to the criteria listed on assignment sheet.

Assignment Sheet 2—Student performance should be evaluated according to criteria listed on assignment sheet. Answers for the questions are:

MSDS 1—Duracell Alkaline Battery

1. Potassium hydroxide, manganese dioxide, zinc, mercury
2. Batteries may release toxic mercury vapors when battery-can integrity is broken.
3. Immediately flush skin with water. For eye contact, flush with copious amounts of water for 15 minutes and see a physician at once.
4. Do not incinerate since battery may explode.
5. When handling leaking batteries, use neoprene, rubber, or latex nitrile gloves. Store at room temperature and in a dry place.
6. Install according to equipment instructions. Do not recharge or dispose of in fire. Replace all batteries in equipment at the same time. Do not mix battery systems of different types, such as alkaline and zinc-carbon batteries. Do not carry batteries loose in your pocket or carrying bag. Check batteries periodically when in use.

MSDS 2—Mobil Lubricating Oil

1. None
2. Refined mineral oils
3. Slight skin irritation
4. Eye contact—Flush with water
   Skin contact—Wash contact areas with soap and water
   Inhalation—None
   Ingestion—Not a problem, but if uncomfortable, seek medical assistance
5. Strong oxidizers
6. Carbon dioxide, foam, dry chemical, water fog
7. Firefighters must use self-contained breathing apparatus.
8. Absorb on fire-retardant-treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste-disposal facility in accordance with current applicable laws and regulations and with product characteristics at time of disposal.

Basic Workplace Safety and First-Aid Skills
Unit 4

Answers to Written Test

1.

a.	10	e.	3	i.	6
b.	5	f.	8	j.	7
c.	1	g.	9		
d.	2	h.	4		

2. Any five of the following:

   a. Wear clothing appropriate for the work being performed.
   b. Confine long hair before operating equipment.
   c. Wear safety glasses when operating equipment.
   d. Remove ties and secure loose clothing when working around machine tools or rotating equipment.
   e. Conduct yourself in a manner conducive to safe store practices.
   f. Use soap and water frequently as a method of preventing skin diseases.
   g. Observe smoking regulations.
   h. Be alert.

3. b, e, f, h

4.

a.	2	f.	4	k.	4	p.	3
b.	4	g.	2	l.	1	q.	2
c.	2	h.	2	m.	1	r.	2
d.	3	i.	4	n.	4	s.	1
e.	1	j.	3	o.	3	t.	3

5. Any six of the following:

   a. Make sure that the ladder has non-skid safety shoes.
   b. Inspect the ladder before use for worn safety shoes, broken or loose rungs/steps, or other defects.
   c. Inspect the ladder rungs/steps and siderails for oil or other slippery materials before you climb.
   d. Be sure that ladders—particularly metal ladders—are clear of electrical hazards.
   e. Locate the ladder away from doors or other openings that are not blocked or guarded.
   f. Place ladder feet on a level, non-skid surface.
   g. Place ladder at a safe angle to work: at least 1 foot from the wall for every 4 feet of height.
   h. Use rung locks to secure the sections of extension ladders.
   i. Place top of extension and straight ladders at least three rungs above the work.
   j. Get a helper to heel straight or extension ladders.
   k. Face the ladder when climbing up and down.
   l. Never stand on the top rung/step

Answers to Written Test

m. Do not overextend your reach while on the ladder; descend the ladder and reposition it instead.
n. Allow only one person on the ladder at a time.
o. Do not use ladders for makeshift scaffolds.
p. Store ladders securely when not in use.

6. a, b, e, f

7. b, c, d

8. In any order

a. Ingestion
b. Absorption
c. Inhalation

9. a. 2
b. 1
c. 3
d. 4

10. a. 2
b. 1
c. 3
d. 4

11. a, b, c

12. Five of the following in any order:

a. Handle batteries and battery acid with care.
b. Transport a battery safely with a battery carrier.
c. Avoid overfilling a battery, especially if it is soon to be charged.
d. Do not work on batteries during discharge or charge.
e. Do not charge a discharged "run down" battery that is frozen.
f. Avoid spilling electrolyte and rinse hydrometer after use.

13. a. 3 e. 6
b. 5 f. 2
c. 1 g. 4
d. 7

14. Any two of the following:

a. Always wear eye protection; splash proof goggles are recommended
b. Protect your face, hands, and clothing with a face shield, gloves, and protective apron.
c. Do not wear metal jewelry when working around lead/acid batteries.

Answers to Written Test

15. Flush eyes immediately with generous amounts of water or eye solution and see a physician as soon as possible.

16. Flush the area with generous amounts of water.

17. Elevate the wound, apply direct pressure to stop bleeding, clean the wound, evaluate the extent of the injury and determine if a physician should be seen.

18. Any three of the following:

    a. Store paints, thinners, cutting oils, and solvents in approved areas.
    b. Learn location and use of fire extinguishers for flammable liquid fires.
    c. Store all flammable liquids in approved safety containers.
    d. Observe smoking regulations.
    e. Keep flammable liquids storage area clear of trash and rags.
    f. Periodically check electrical connections in storage area.

19. Any five of the following:

    a. Dust shelves, bins, and stock items at regular intervals.
    b. Wipe any grease or oil from floors, bins, or shelves.
    c. Keep floors and aisles clear of trash or any obstacles that could create a tripping hazard.
    d. Do not sweep trash into a pile; put it in a proper trash container.
    e. Place unsold or new merchandise onto the correct shelf or into the correct bin, and inspect all stock items at regular intervals to make sure they are correctly placed.
    f. Sweep floors and aisles at regular intervals.
    g. Always return brooms and other cleanup equipment to a proper storage area.

20. a, b, e, f, h, i

Basic Workplace Safety and First-Aid Skills
Unit 4

Written Test

Name ______________________________ Score ______________

1. Match terms related to basic workplace safety and first-aid skills with their correct definitions. Write the numbers on the blanks provided below.

______a. State or condition of being safe; freedom from danger, risk, or injury

______b. Potential source of danger

______c. Any suddenly occurring, unintentional event which causes injury or property damage

______d. Capable of being easily ignited and burning quickly at temperatures below 100°F

______e. Immediate, temporary care given the victim of an accident or sudden illness until the services of a physician can be obtained

______f. Form that lists and explains each of the hazardous materials that an employee works with so that the employee can safely use the material and respond to emergency situations

______g. Occupational Safety and Health Act; federal legislation designed to ensure safe and sanitary working conditions

______h. Capable of bursting into flames at temperatures below 100°F

______i. An abbreviation for "hazardous materials" used in federal safety programs

______j. Any cancer-causing, corrosive, toxic irritant, sensitizer, or material that has the potential for damaging effects on specific body organs

1. Accident
2. Combustible
3. First aid
4. Flammable
5. Hazard
6. HazMat
7. Hazardous material
8. Material Safety Data Sheet (MSDS)
9. OSHA
10. Safety

Written Test

2. List five rules for personal safety.

a. ____

____

b. ____

____

c. ____

____

d. ____

____

e. ____

____

3. Select true statements concerning guidelines for maintaining a safe work environment by placing an "X" in the appropriate blanks.

______a. Move heavy objects as best you can.

______b. Retain all guards and safety devices on power equipment.

______c. Leave defective tools or equipment in a place where someone else can find them and report them to the manager.

______d. Report only severe accidents to the manager.

______e. Remove trash and litter from aisles and place it in a proper trash container.

______f. Use parts transporting carts and handtrucks properly and safely.

______g. Throw a little sawdust on grease and oil spots on floors and in aisles.

______h. Use ladders or step stools to reach upper shelves.

______i. Lift heavy objects with your back, not your legs.

Written Test

4. Complete the following list of guidelines for lifting and moving items safely. Write the correct number on the blank provided before each item below.

Before lifting

______a. Inspect the item to be lifted for ____________, and grease or other slippery surfaces.

1. wrapping, handholds
2. jagged edges, splinters
3. size, weight
4. obstacles, wrapping

______b. Wear ____________ for protection, and make sure that they fit correctly.

1. steel-toed shoes
2. safety goggles
3. ankle supports
4. gloves

______c. Wear ____________ support.

1. abdominal
2. lower-back
3. neck
4. shoulder

______d. Plan your ____________ before you lift.

1. strategy
2. tactics
3. route
4. position

______e. Clear any ____________ from your path.

1. obstacles
2. guests
3. employees
4. floor coverings

Written Test

______f. Assess the ____________ of the load.

1. area
2. circumference
3. square footage
4. weight

______g. ____________ to lift heavy loads.

1. Use your back
2. Get help
3. Call a professional
4. Use a pry bar

______h. Use a ____________ to move very heavy, large,or awkward loads that cannot (or should not) be lifted by two people.

1. ramp
2. dolly
3. laundry cart
4. bus cart

Lifting

______i. Place your ____________ as close to the load as possible.

1. head
2. shoulders
3. hip
4. feet

______j. Bend your knees, keeping your ____________ straight and your chin tucked in.

1. leg muscles
2. arms and shoulders
3. back and neck
4. feet

______k. Grasp the load ____________ with your fingers and hands.

1. loosely
2. at the top
3. at the bottom
4. firmly

205

Written Test

______l. Draw your ____________ in close to your body.

1. arms
2. knees
3. feet
4. buttocks

______m. Stand slowly and lift smoothly, using you ____________.

1. legs
2. shoulders
3. back
4. knees

Carrying

______n. Hold the item ____________.

1. at least 1 foot from waist
2. at knee level
3. at shoulder level
4. close to your body

______o. Do not allow the load to ____________.

1. touch your chest
2. rest on your shoulder
3. block your vision
4. shift toward your body

______p. Do not ____________ or twist your body to change direction.

1. set the load down
2. turn your head
3. change your grip
4. adjust your footing

______q. Learn the ____________.

1. hip carry
2. shoulder carry
3. knee support carry
4. head carry

Written Test

Setting the load down

______r. Bend your ____________.

1. arms
2. knees
3. back
4. head

______s. Keep your ____________ straight and aligned.

1. back and neck
2. knees and legs
3. arms and elbows
4. chin and head

______t. Be sure the load is ____________.

1. level
2. loose
3. secure
4. limited

5. List six rules for using ladders safely.

a. ____
____

b. ____
____

c. ____
____

d. ____
____

e. ____
____

f. ____
____

Written Test

6. Select true statements concerning rules for hazardous material safety by placing an "X" in the appropriate blanks.

   ______a. Use a solvent only after determining its properties, the kind of work it has to do, and how to use it.

   ______b. Use and store potentially hazardous materials and products strictly according to label instructions and cautions.

   ______c. Clean up any spilled liquids when you have time.

   ______d. Store oily rags or oily waste in an open trash barrel.

   ______e. Store other hazardous materials only in an area that meets local, state, and national codes, away from heat or open flame.

   ______f. Always read labels and follow instructions for proper storage.

7. Select true statements concerning purposes of material safety data sheets by placing an "X" in the appropriate blanks.

   ______a. MSDS include information on long-term exposure to a specific chemical, and statistics from the American Medical Association concerning toxicity studies.

   ______b. MSDS include information concerning the level of protective gear needed for handling a given material.

   ______c. MSDS include first aid information necessary for treatment of exposure to a given material.

   ______d. MSDS include information to tell the user how to respond to accidents with the given material.

8. List three ways hazardous materials can enter the body.

   a. ____

   b. ____

   c. ____

Written Test

9. Match the classes of fires on the right with their correct definitions. Write the numbers on the blanks provided below.

_____a. Fires that occur with flammable liquids such as gasoline, oil, grease, paint, and thinners

_____b. Fires that occur in ordinary combustible materials such as wood, rags, and rubbish

_____c. Fires that occur in or near electrical equipment such as motors, switchboards, and electrical wiring

_____d. Fires that occur with combustible metals such as magnesium

1. Class A
2. Class B
3. Class C
4. Class D

10. Match the types of fire extinguishers on the right with the class or classes of fire each is designed to extinguish. Write the numbers on the blanks provided below.

_____a. Used on class A and B fires

_____b. Used on class A fires

_____c. Used on class B and C fires

_____d. Used on class B, C, and D fires

1. Pressurized water
2. Foam
3. Carbon dioxide
4. Dry chemical

11. Select true statements concerning OSHA regulations for battery safety by placing an "X" in the appropriate blanks.

_____a. Deluge showers and eye baths should be provided adjacent to the battery charging area.

_____b. Batteries should be stored and charged only in well-ventilated areas; do not breathe fumes from a battery.

_____c. All sources of ignition should be remote from the battery charging or storage area; there must be no smoking, no lighted matches or lighters, and no sparking from tools.

Written Test

12. List five general rules of battery safety.

a. ____

b. ____

c. ____

d. ____

e. ____

13. Match the potential battery hazards on the right with ways to avoid them. Write the numbers on the blanks provided below.

______a. Always disconnect the ground cable of the battery before working on rotating parts of a vehicle.

______b. Connect or disconnect only when the charger is turned off and unplugged, and the cell covers are in place.

______c. Always use the proper instruments; do not short across the battery terminals because the resulting spark could cause an explosion.

______d. Never jump a frozen battery or a battery low on water.

______e. Never stand with your face directly over a charging battery; the fumes are toxic, and an explosion could spray acid into your face.

______f. When removing a battery, disconnect the grounded clamp first; when installing a battery, connect the grounded clamp last.

______g. If these have been removed, they should be replaced before moving a battery.

1. Battery testing
2. Battery clamp removal and installation
3. Rotating parts of machinery
4. Vent caps
5. Battery charger
6. Fumes from battery acid
7. Jumping a battery

Written Test

14. List two personal safety rules for working with batteries.

a. ______________________________

b. ______________________________

15. Solve the following problem concerning first aid procedures for personal acid splashes by answering the question.

An employee has just suffered an acid splash and complains that the acid is burning her eyes; what is the recommended first aid procedure?

____

16. Solve the following problem concerning emergency procedures for acid spills on floors and equipment by answering the question.

Acid has just spilled onto a tile-covered floor and there is no ammonia solution or bicarbonate of soda solution available to neutralize it; what is the recommended emergency procedure?

____

17. Solve the following problem concerning first aid procedures for cuts and scrapes by answering the question.

A co-worker has just slammed his finger in the hood of a customer's car, severely cutting his thumb; what is the recommended first aid procedure?

____

____

18. List three safety rules concerning flammable liquids.

a. ______________________________

b. ______________________________

c. ______________________________

Written Test

19. List five housekeeping procedures for warehouses and stockrooms.

a. ______________________________

____

b. ______________________________

____

c. ______________________________

____

d. ______________________________

____

e. ______________________________

____

20. Select true statements concerning housekeeping procedures for counter and display areas by placing an "X" in the appropriate blanks.

_____a. Keep windows clean inside and out.

_____b. Dust and straighten displays regularly.

_____c. Keep window and counter clear of merchandise.

_____d. Inspect, clean, and straighten undercounter items monthly.

_____e. Keep counter supplies and counter literature neat and orderly.

_____f. Return unsold parts to stock room.

_____g. Sweep and mop floor weekly.

_____h. Place all trash in a proper trash container.

_____i. Always return brooms and other cleanup equipment to a proper storage area.

***Permission to duplicate this test is granted.**

Basic Workplace Safety and First-Aid Skills
Unit 4

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Complete a Safety Inspection Rating ______

Comments: ____

____

Assignment Sheet 2—Interpret Material Safety Data Sheets Rating ______

Comments: ____

____

Assignment Sheet 3—Analyze Scenarios to Determine Appropriate Safety Practices Rating ______

Comments: ____

____

Job Sheet 1—Lift a Heavy Object Properly Rating ______

Comments: ____

____

Job Sheet 2—Place and Climb a Ladder Safely Rating ______

Comments: ____

____

Unit Evaluation Form

Written Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ________________________ Date __________

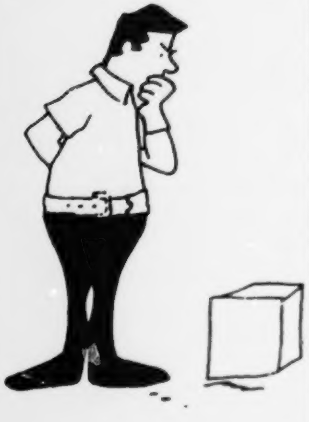
Student Signature ________________________ Date __________

***Permission to duplicate this form is granted.**

How to Lift Safely

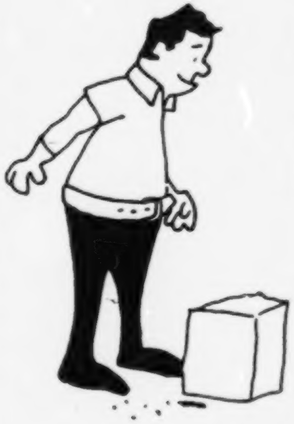
1

Approach the load and size it up as to weight, size, and shape. Consider your physical ability to handle the load.



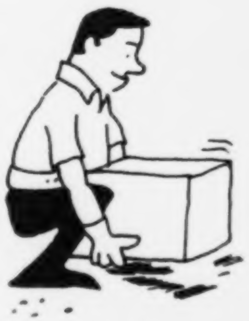
2

Place feet close to the object to be lifted and 8 to 12 inches apart for good balance.



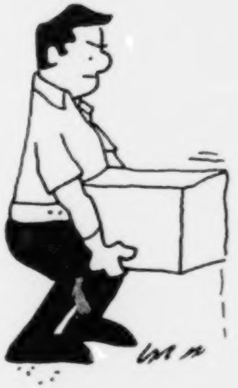
3

Bend the knees to the degree that is comfortable and get a good handhold. Then using both leg and back muscles . . .



4

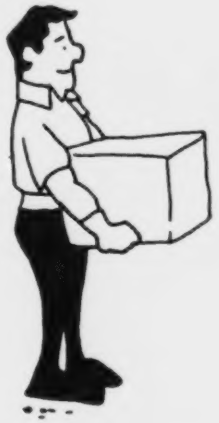
Lift the load straight up smoothly and evenly. Push with your legs, and keep the load close to your body.



How to Lift Safely
(Continued)

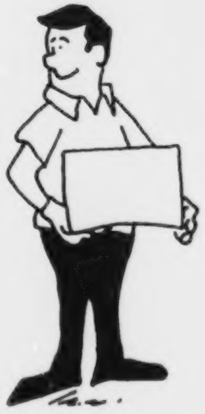
5

Lift the object into carrying position, making no turning or twisting movements until the lift is completed.



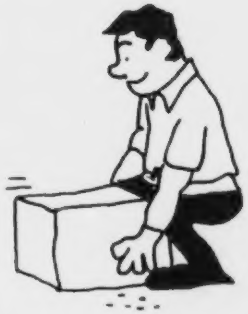
6

Turn your body with changes of foot position after looking over your path of travel, making sure it is clear.

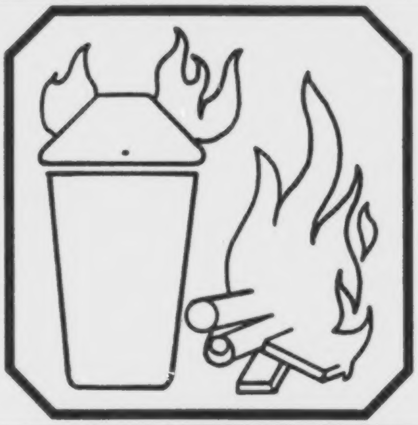
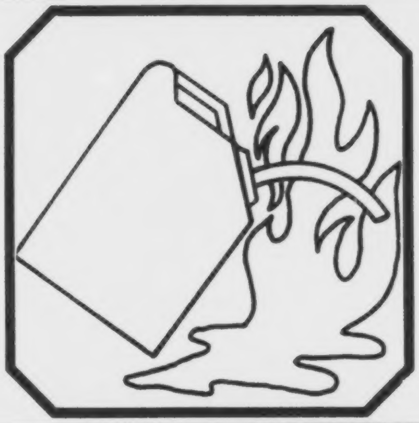
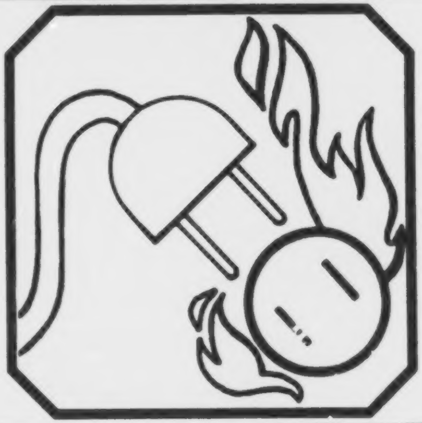


7

Setting the load down is just as important as picking it up. Using leg and back muscles, comfortably lower load by bending your knees. When load is securely positioned, release your grip.



Fire Extinguisher Markings

Ordinary A combustibles (Green)	
Flammable B liquids (Red)	
Electrical C equipment (Blue)	

Basic Workplace Safety and First-Aid Skills
Unit 4

Information Sheet

1. **Terms and definitions**

   a. **Accident** — Any suddenly occurring, unintentional event which causes injury or property damage

   b. **Combustible** — Capable of being easily ignited and burning quickly at temperatures below 100°F

   c. **First aid** — Immediate, temporary care given the victim of an accident or sudden illness until the services of a physician can be obtained

   d. **Flammable** — Capable of bursting into flames at temperatures below 100°F

   e. **Hazard** — Potential source of danger

   f. **HazMat** — An abbreviation for "hazardous materials" used in federal safety programs

   g. **Hazardous materials** — Any cancer-causing, corrosive, toxic irritant, sensitizer, or materials that has the potential for damaging effects on specific body organs

   h. **Material Safety Data Sheet (MSDS)** — Form that lists and explains each of the hazardous materials that an employee works with so that the employee can safely use the material and respond to emergency situations

   i. **Occupational Safety and Health Act (OSHA)** — Federal legislation designed to ensure safe and sanitary working conditions for employees

   j. **Safety** — State or condition of being safe; freedom from danger, risk, or injury

2. **Rules for personal safety**

   a. Wear safety glasses when operating equipment.

   b. Wear clothing appropriate to work being performed.

   c. Confine long hair before operating equipment.

   d. Remove ties and secure loose clothing when working around machine tools or rotating equipment.

   e. Conduct yourself in a manner conducive to safe store practices.

Information Sheet

f. Use soap and water frequently as a method of preventing skin diseases.

g. Observe smoking regulations.

h. Be alert.

3. **Guidelines for maintaining a safe work environment**

   a. Retain all guards and safety devices on power equipment.

   b. Report defective tools, machines, or other equipment to the manager.

   c. Report all accidents to the manager regardless of the nature or severity.

   d. Remove trash and litter from aisles and place it in a proper trash container.

   e. Use parts transporting carts and handtrucks properly and safely.

   f. Remove all grease and oil from floor or aisles.

   g. Use ladders or step stools to reach upper shelves.

   h. Know location of fire fighting equipment and first-aid station.

   i. List heavy objects with your legs, not your back.

   j. Make sure objects do not protrude out of bins or shelves.

   k. Keep floors in display area clean and free of debris.

4. **Guidelines for lifting and moving items safely**

   a. **Before lifting**

   - Inspect the item to be lifted for jagged edges, splinters, and grease or other slippery surfaces.
   - Wear gloves for protection, and make sure that they fit properly.
   - Wear lower-back support.

     Example: Leather lower-back support belt
   - Plan your route before you lift.
   - Clear any obstacles from your path.

Information Sheet

- Assess the weight of the load.
- Get help to lift heavy loads.

  Note: Teamwork works best when both persons are about the same size. The load should be distributed evenly between both workers.
- Use a dolly to move very heavy, large,or awkward loads that cannot (or should not) be lifted by two people.

  Examples: Piano, refrigerator, sofa bed

b. **Lifting**

- Place your feet as close to the load as possible, one foot alongside the load and the other behind it.
- Bend your knees, keeping your back and neck straight and your chin tucked in.
- Grasp the load firmly with your fingers and hands.
- Draw your arms in close to your body.
- Stand slowly and lift smoothly, *using your legs*.

c. **Carrying**

- Hold the item close to your body.
- Do not allow the load to block your vision.
- Do not change your grip or twist your body to change direction.

  Note: To avoid back injury, turn with your feet and move your whole body.
- Learn the shoulder carry.

d. **Setting the load down**

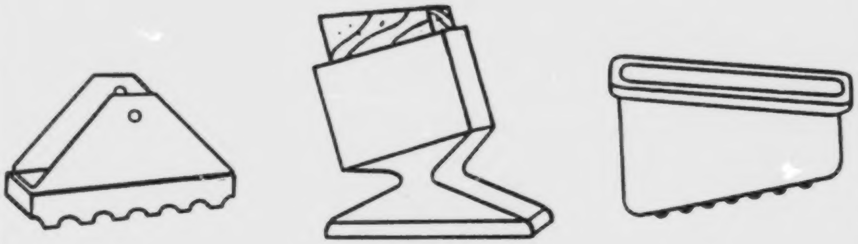
- Bend your knees.
- Keep your back and neck straight and aligned.
- Place the load carefully on the floor or shelf, taking care not to set it on your fingers or feet.
- Be sure the load is secure.

Information Sheet

5. Rules for using ladders safely

a. Make sure that the ladder has non-skid safety shoes (Figure 1).

Figure 1



Shoe for metal stepladder

Rubber shoe for wood extension ladder

Rubber shoe for either wood or metal stepladder

b. Inspect the ladder before use for worn safety shoes, broken or loose rungs/steps, or other defects.

c. Inspect the ladder rungs/steps and siderails for oil or other slippery materials before you climb.

d. Be sure that ladders—particularly metal ladders—are clear of electrical hazards.

e. Locate the ladder away from doors or other openings that are not blocked or guarded.

f. Place ladder feet on a level, non-skid surface.

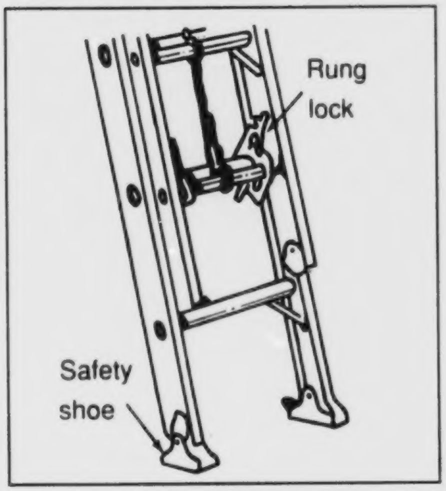
g. Place ladder at a safe angle to the work: at least 1 foot from the wall for every 4 feet of height.

Note: Get help in carrying and raising heavy or long ladders.

Information Sheet

h. Use rung locks (see Figure 2) to secure the sections of extension ladders.

Figure 2



i. Place top of extension and straight ladders at least three rungs above the work.

j. Get a helper to heel straight or extension ladders (Figures 3 and 4).

Figure 3

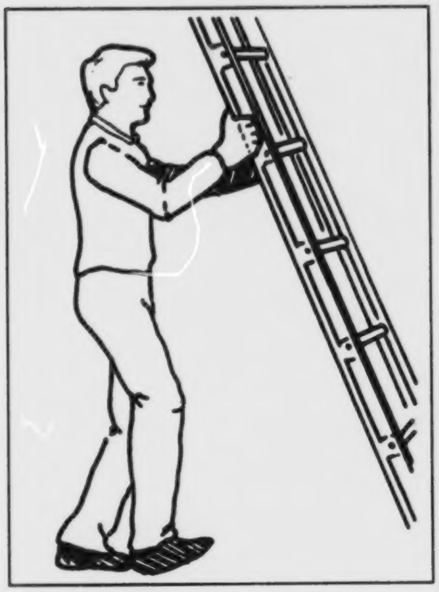
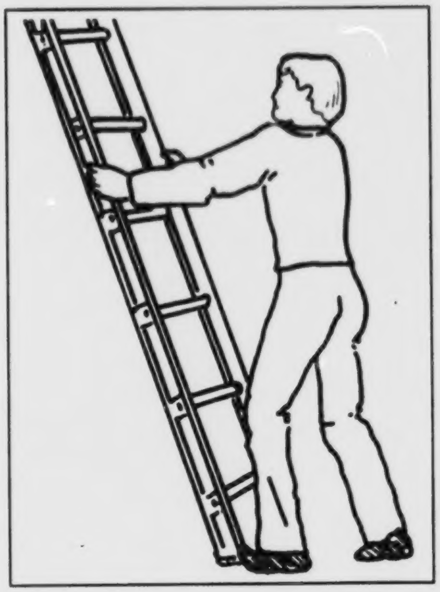


Figure 4



Information Sheet

k. Face the ladder when climbing up and down.

l. Never stand on the top rung/step.

m. Do not overextend your reach while on the ladder; descend the ladder and reposition it instead.

n. Allow only one person on the ladder at a time.

o. Do not use ladders for makeshift scaffolds.

p. Store ladders securely when not in use.

6. **Rules for hazardous material safety**

a. Use a solvent only after determining its properties, the kind of work it has to do, and how to use it.

b. Use and store potentially hazardous materials and products strictly according to label instructions and cautions.

c. Clean up any spilled liquids immediately.

d. Store oily rags or oily waste in self-closing or spring-lid metal containers.

e. Store other hazardous materials only in an area that meets local, state, and national codes, away from heat or open flame.

f. Always read labels and follow instructions for proper storage.

7. **Purposes of material safety data sheets (MSDS)**

a. To inform user of material's physical properties or fast-acting health effects that make it dangerous to handle

b. To tell the user the level of protective gear needed

c. To tell the user the first aid treatment necessary if exposed to the product or its hazards

d. To tell the management and the user the preplanning needed for safely handling spills, fires, and day-to-day operations

e. To tell the user how to respond to accidents

Information Sheet

8. **Ways hazardous materials can enter the body**

   a. **Ingestion** — By mouth

      Example: Swallowing carburetor cleaner

   b. **Absorption** — Through the skin

      Example: Benzene infiltration through the skin when handling gasoline without protective gloves

   c. **Inhalation** — By breathing in gases, vapors, fumes, and other forms of material

      Example: Inhaling asbestos particles while working with brake pads and linings and clutch disks

9. **Classes of fires and their definitions**

   a. **Class A** — Fires that occur in ordinary combustible materials such as wood, rags, paper, rubbish

   b. **Class B** — Fires that occur with flammable liquids such as gasoline, oil, grease, paint, solvent, and thinners

   c. **Class C** — Fires that occur in or near electrical equipment such as motors, switchboards, and electrical wiring

   d. **Class D** — Fires that occur with combustible metals such as magnesium, phosphorus, or sodium

10. **Types of fire extinguishers and classes of fires they are designed to extinguish**

    Note: For many years the soda/acid type fire extinguisher was a popular, economical model used in many public buildings. It was the model that required being turned upside down to activate a soda-water and acid reaction which created CO_2, which in turn pushed the soda-water and neutralized acid solution out a hose and nozzle. This fire extinguisher, effective only on Class A fires, was regulated out of existence by the federal government because of the superior qualities of pressurized water, foam and CO_2 fire extinguishers. Even if a soda/acid fire extinguisher should still be in service, it should not be depended upon in an emergency.

    a. **Pressurized water** — Used on class A fires

    b. **Foam** — Used on class A and B fires

    c. **Carbon dioxide (CO_2)** — Used on class B and C fires

Information Sheet

d. **Dry chemical** — Used on class B, C, and D fires

Note: On class D fires, dry sand is as effective as any dry chemical other than Purple X, a special material made for combustible metal fires; the cost of Purple X chemical places it out of reach of most shops.

11. OSHA regulations for battery safety

Note: Automotive (lead/acid) batteries contain a sulfuric acid electrolyte surrounding lead plates. This electrolyte is highly corrosive and can harm human tissue (skin, eyes, nasal and breathing passages) with even the most casual contact. Safety glasses should be worn at all times when working with these batteries, especially if the cell caps have been removed to add distilled water to the electrolyte solution, or to make a hydrometer test of the electrolyte.

a. Deluge showers and eye baths should be provided adjacent to the battery charging area.

b. Batteries should be stored and charged only in well-ventilated areas; do not breathe fumes from a battery.

c. All sources of ignition should be remote from the battery charging or storage area; there must be no smoking, no lighted matches or lighters, and no sparking from tools

Note: The chemical reaction that takes place when a lead/acid battery is being charged gives off hydrogen gas, a highly explosive, odorless, colorless material. Any nearby spark or flame can cause the battery to explode, injuring bystanders with chemical burns and fragmentation wounds.

12. General rules of battery safety

a. Handle batteries and battery acid with care.

b. Transport a battery safely with a battery carrier.

c. Avoid overfilling a battery, especially if it is soon to be charged.

Note: Charging a battery causes heat to build up inside its cells; therefore, if too much electrolyte is present, it is possible the heat could cause it to expand enough to run over.

d. Do not work on batteries during discharge or charge.

Information Sheet

e. Do not charge a discharged "run down" battery that is frozen.

Note: A discharged battery's electrolyte is mainly water because the chemical reaction of discharging the battery reduced the concentration of the acid within the battery. If this electrolyte is frozen and a battery charger is connected to the battery, heat from the charging process can cause steam to build up in trapped areas of the battery causing an explosion.

f. Avoid spilling electrolyte and rinse hydrometer after use.

13. Potential battery hazards and ways to avoid them

a. **Rotating parts of machinery** — *Always disconnect the ground cable* of the battery before working on rotating parts of a vehicle.

Note: Since 1956 U.S. produced vehicles and lawn and garden equipment have been designed in a standardized fashion with electrical systems "negative ground," or the negative pole of the battery leading to the grounding clamp or bolt. Before that time, some Chrysler products were "positive ground." Few of these vehicles remain active, but a parts specialist should always be certain to check the grounding source when working on any vehicle to avoid personal injury or damage to the electrical system itself.

b. **Battery charger** — Connect or disconnect only when the charger is turned off and unplugged, and the cell covers are in place to avoid sparks and possible explosion.

c. **Battery testing** — Always use the proper instruments; do not short across the battery terminals because the resulting spark could cause an explosion.

d. **"Jumping" a battery** — Never attach "jumper cables" or a battery charger to a frozen battery or a battery low on water.

e. **Fumes from battery acid** — Never stand with your face directly over a charging battery; the fumes contain sulfuric acid and hydrogen gas.

f. **Battery clamp removal and installation** — When removing a battery, *disconnect the grounded clamp first*; when installing a battery, connect the grounded clamp last.

g. **Vent caps** — If these have been removed, they should be replaced before moving a battery.

Note: Many new auto batteries are of "maintenance free" design, meaning they have no removable cell vent caps. The majority of aftermarket replacement batteries, however, are equipped with vented caps which may be removed to observe or add to electrolyte as needed.

14. Personal safety rules for working with batteries

a. Always wear eye protection; splash-proof goggles are recommended.

b. Protect your face, hands, and clothing with a face shield, gloves, and protective apron.

c. Do not wear metal jewelry (rings, ID bracelets, etc.) when working around lead/acid batteries.

15. First aid procedures for personal acid splashes

a. Immediately wash any part of the body or clothing that comes into contact with acid.

b. Use generous amounts of water on any skin areas where acid has splashed.

c. When acid gets into eyes, flush the eyes immediately with generous amounts of water or eye solution and see a doctor as soon as possible.

d. If acid is accidentally ingested, drink plenty of water or milk and follow that with milk of magnesia, beaten eggs, or vegetable oil, and see a physician as soon as possible.

16. Emergency procedures for acid spills on floors and equipment

Caution: Even though an acid spill may not immediately affect a person, the fumes are potentially hazardous, and the acid will quickly eat away floor coverings and paint if not neutralized.

a. Neutralize the spill with a weak ammonia solution.

b. Neutralize the spill with a bicarbonate of soda solution.

c. Neutralize the spill by immediately flushing the area with generous amounts of water.

Information Sheet

17. First aid procedures for cuts and scrapes

Caution: Given the increased awareness of diseases carried by blood borne pathogens, Hepatitis B, Human Immunodeficiency Virus (HIV), and others, the U.S. Department of Labor in its brochure, *Occupational Exposure to Bloodborne Pathogens*, states that universal precautions be observed any time blood or other human body fluid is present. Where it is impossible to determine the type of body fluid present, all body fluids are to be considered as potentially infectious.

a. Stop bleeding by raising the affected part and applying constant direct pressure with your hand.

b. Cleanse wound with soap and water to remove visible dirt; hydrogen peroxide is a good antiseptic.

c. Evaluate the extent of the injury.

Note: Deep wounds often cause serious injury even if they don't appear serious. Also, cuts on the hands and arms are frequently associated with tendon and nerve damage.

d. See a physician if you can't stop the bleeding, if the wound is deep or long, if it appears stitches will be needed, if the victim is especially prone to infection, or if it is uncertain when the victim has last had a tetanus vaccination.

18. Safety rules concerning flammable liquids

a. Store paints, thinners, cutting oils, and solvents in approved areas.

b. Learn location and use of fire extinguishers for flammable liquid fires.

c. Store all flammable liquids in approved safety containers.

d. Observe smoking regulations.

e. Keep flammable liquids storage area clear of trash and rags.

f. Periodically check electrical connections in storage area.

Information Sheet

19. **Housekeeping procedures for warehouses and stock rooms**

   a. Dust shelves, bins, and stock items at regular intervals.

   b. Wipe any grease or oil from floors, bins, or shelves.

   c. Keep floors and aisles clear of trash or any obstacles that could create a tripping hazard.

   d. Do not sweep trash into a pile; put it in a proper trash container.

   e. Place unsold or new merchandise onto the correct shelf or into the correct bin, and inspect all stock items at regular intervals to make sure they are correctly placed.

   f. Sweep floors and aisles at regular intervals.

   g. Always return brooms and other cleanup equipment to a proper storage area.

20. **Housekeeping procedures for counter and display areas**

   a. Keep windows clean, inside and out.

   b. Dust and straighten displays regularly.

   c. Keep window and counter merchandise neat and clean.

   d. Inspect, clean, and straighten undercounter items daily.

   e. Keep counter supplies and counter literature neat and orderly.

   f. Return unsold parts to stock room.

   g. Sweep and mop floor daily.

   h. Place all trash in a proper trash container.

   i. Always return brooms and other cleanup equipment to a proper storage area.

Basic Workplace Safety and First-Aid Skills
Unit 4

Student Supplement 1—Guidelines for Interpreting Material Safety Data Sheets

Living in the modern world, you probably are aware that the use of chemicals offers convenience and progress at home and work. Naturally, you want to avoid dangerous overexposure to chemicals, especially on the job. Such overexposure is possible no matter where you work, even in an office or light industry.

Your company's hazard communications, or HazCom, program was created to protect your health and safety. Three important elements are at the heart of your HazCom program: warning labels on containers, training on the safe use and handling of chemicals, and material safety data sheets (MSDSs).

What is on a MSDS

MSDSs are printed pages that give you all the critical information you need about how to use, transport, and store chemicals in order to protect yourself, as well as what to do in case of emergencies and overexposure. Information on MSDSs includes:

- The chemical's name or names
- Name, address, and phone number of the manufacturer
- List of the chemical's ingredients
- Permissible exposure limits (PEL) or threshold limit value (TLV)
- What conditions or other substances will cause the chemical to catch fire, explode, melt, or turn into dangerous gases
- How the chemical usually looks and smells
- How to put out a fire involving the chemical
- What to do if the chemical spills or leaks
- How to prevent dangerous exposure
- Health hazards such as skin irritant or cancer-causing agent
- Symptoms of overexposure
- What to do if you are overexposed
- When the MSDS was prepared

The information for each chemical's MSDS is put together by the manufacturer or distributor for that chemical. The sheets often look different from each other, but they still provide the same information. The law requires your employer to keep MSDSs up to date and to send the MSDS to your doctor or designated representative if you request it.

Where the MSDS is kept

MSDSs must be readily accessible to employees—a posted sign may tell you where, and you can also find out by reading your company's written HazCom program. If you are not sure where to find MSDSs, your supervisor or your company's HazCom contact will make them available to you. It is the law.

Student Supplement 1

When to read a MSDS

You should always read the MSDS *before* you begin a job using a chemical. Even if you have used the chemical before, the manufacturer may have changed its formula, which may change the steps you should take to protect yourself. Taking proper precautions listed on the MSDS, such as wearing a respirator, can prevent serious long-term illnesses.

If you do not understand something on the MSDS, or have questions about your company's HazCom program, ask your supervisor or company contact. Your company knows that HazCom works best if you are fully informed and involved.

How to read a MSDS

The material safety data sheet, or MSDS, is written information that can help protect you from overexposure to chemicals you find on the job. The MSDS is part of your company's hazard communications program. Each company can design its own MSDS form, and the sections may be in a different order. But, the basic kinds of information on any MSDS will be the same.

Chemical name (see Figure 1). Lists the identity of the substance (the name on the label), date the MSDS was prepared, the name and address of the manufacturer, and usually a phone number for emergencies and more information.

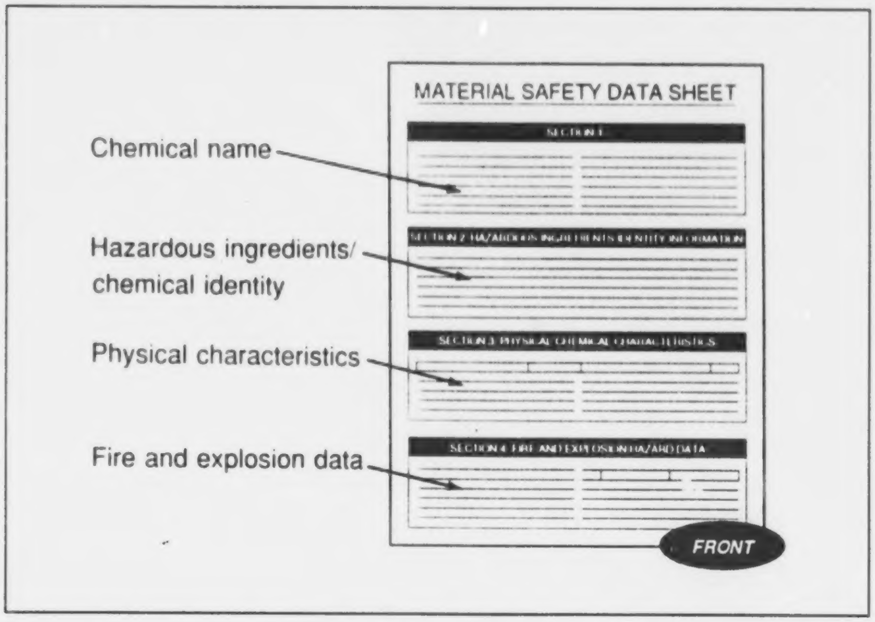
Hazardous ingredients/chemical identity (see Figure 1). Includes names of substances in the chemical that might be dangerous, and lists safety exposure limits such as permissible exposure limit or PEL (set by OSHA) or the threshold value limit or TVL. Also lists common names for the chemical.

Physical characteristics (see Figure 1). Describes many physical qualities of the chemical, and lets you know what is usual or safe. For example, how the chemical looks and smells; boiling and melting temperatures (important in case a chemical might become a gas you could breathe); evaporation rate (known as *percent volatile*); how easily the chemical dissolves; and how heavy it is (this tells you if it will sink, float, or dissolve in water).

Fire and explosion data (see Figure 1). Tells you the lowest temperature at which the chemical could catch fire (flash point). Lets you know if it is flammable (catches fire below 100°F) or combustible (catches fire above 100°F). Lists the best way to put out a fire involving that chemical.

Student Supplement 1

Figure 1


MATERIAL SAFETY DATA SHEET
SECTION 1
SECTION 2 HAZARDOUS INGREDIENTS/IDENTITY INFORMATION
SECTION 3 PHYSICAL/CHEMICAL CHARACTERISTICS
SECTION 4 FIRE AND EXPLOSION HAZARD DATA
Chemical name
Hazardous ingredients/ chemical identity
Physical characteristics
Fire and explosion data
FRONT

Reactivity (see Figure 2). Describes what happens if this chemical comes in contact with air, water, or other chemicals. Describes conditions (like heat) or materials (like water) that can cause the chemical to react by burning, exploding, or releasing dangerous vapors. The chemical is called "incompatible" or "unstable" with these conditions or substances.

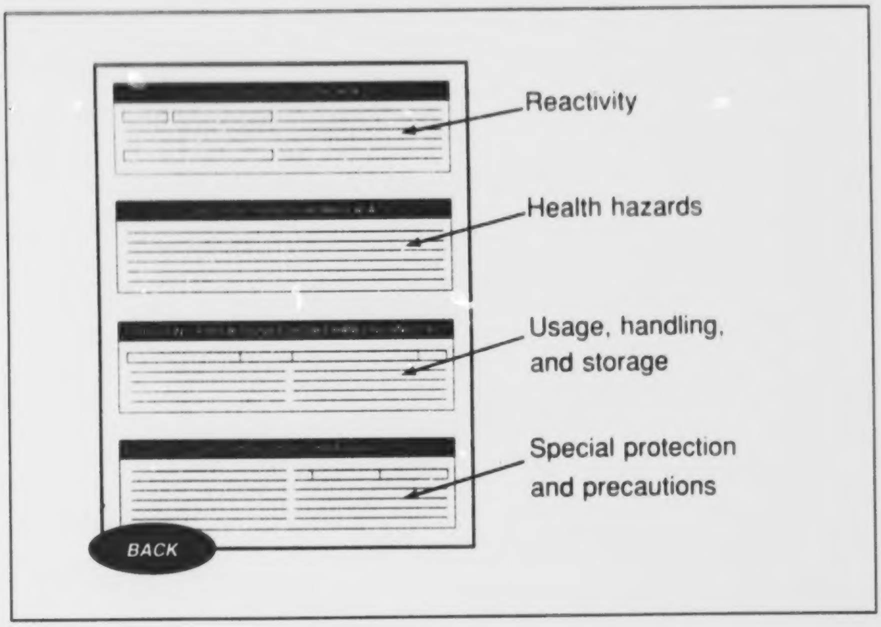
Health hazards (see Figure 2). Lists ways the chemical might enter your body, like splashing on your skin or being breathed in as vapor, as well as possible symptoms of overexposure. Lets you know if overexposure might make existing medical conditions worse, and describes emergency first-aid procedures.

Usage, handling, and storage (see Figure 2). Describes how to clean up an accidental spill, leak, or release, including special procedures. Tells you how to handle, store, and dispose of chemicals safely. Remember, if there is an accident, notify your supervisor immediately. Take care of it yourself only if you are trained to do so and are wearing the proper equipment.

Special protection and precautions (see Figure 2). Explains special personal protective equipment (PPE) and other equipment to use when working with the chemical, special procedures, extra health or safety information, signs that should be posted, and other information not covered in other section.

Student Supplement 1

Figure 2


Reactivity
Health hazards
Usage, handling, and storage
Special protection and precautions
BACK

Terms and abbreviations used on MSDSs

The following terms and abbreviations will help you interpret material safety data sheets.

- **TLV** — Threshold limit value; a time-weighted average concentration *under which* most people can work consistently for 8 hours a day, day after day with no harmful effects
- **Ceiling** — Uppermost limit
- **ACGIH** — American Conference of Governmental Industrial Hygienists
- **OSHA** — Occupational Safety and Health Act
- **PEL** — Permissible exposure limit; the maximum time-weighted concentration *at which* 95 percent of exposed, healthy adults suffer no adverse effects over a 40-hour week
- **ppm** — Parts per million
- **STEL** — Short-time exposure limit; a 15-minute, time-weighted average that should not be exceeded at any time during a workday. Exposures at STEL should not be longer than 15 minutes and should not be repeated more than four times a day with at least 60 minutes between exposures

Student Supplement 1

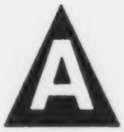
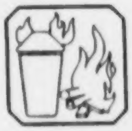
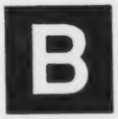
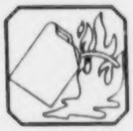
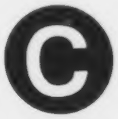
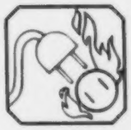
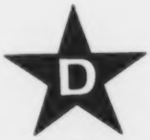
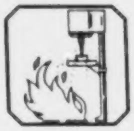
- **IDLH** — Immediately dangerous to life and health; material *at* or *above* this level poses and immediate hazard to life or produces immediate, irreversible, debilitating effects
- **LEL** — Lower explosive limit; below the flammability range (too lean to burn)
- **UEL** — Upper exposure limit; above the flammability range (too rich to burn)

Basic Workplace Safety and First-Aid Skills
Unit 4

Student Supplement 2—Using Portable Fire Extinguishers

All portable fire extinguishers are labeled with picture and shape symbols. Each of the shape symbols (triangle, square, circle, and star) contains the letter of the fire class for which the extinguisher is effective. The picture symbols not only illustrate what type(s) of fire the extinguisher may be used on, but also tell what class(es) of fire the extinguisher should **not** be used on. All of this information, as well as directions for using the extinguisher, are also printed on the extinguisher. However, when a fire is discovered, speed is important, and, as the saying goes, "a picture is worth a thousand words." You should learn to be able to glance at the symbols on an extinguisher and know immediately whether the extinguisher is appropriate for the fire on hand.

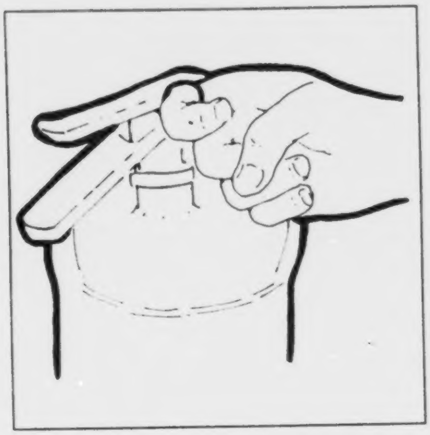
Below are examples of fire-class shape symbols and their meanings, and examples of extinguisher picture symbols and their meanings.

Class A • Ordinary combustibles  (Green) 	**Class B** • Flammable liquids and gases  (Red) 
Class C • Live electrical equipment  (Blue) 	**Class D** • Combustible metals  (Yellow) 

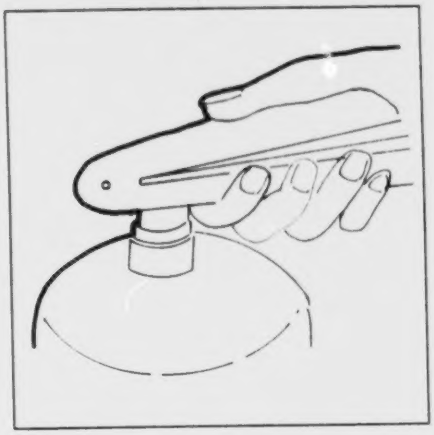
Student Supplement 2

Remember the P-A-S-S sequence when using a portable fire extinguisher.

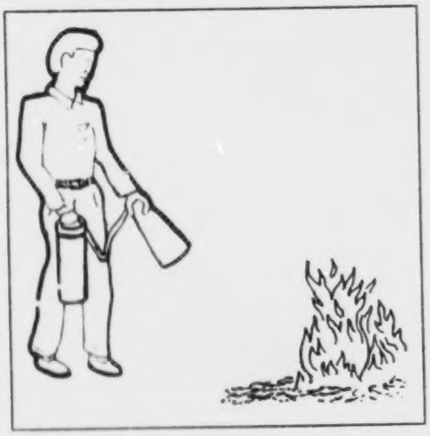
1. **P**ull the pin.



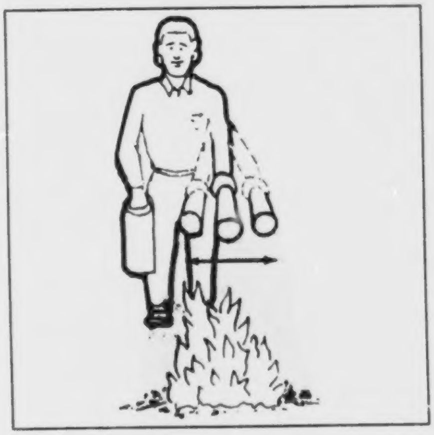
2. **S**queeze the handle.



3. **A**im the nozzle at the base of the fire.



4. **S**weep the nozzle.



Basic Workplace Safety and First-Aid Skills
Unit 4

Student Supplement 3—Fact Sheet on Blood-Borne Pathogens

What are blood-borne pathogens?

- Blood-borne pathogens are disease-causing microorganisms found in blood and blood products such as semen, vaginal secretions, breast milk, cerebrospinal fluid, synovial fluid, amniotic fluid, and other body fluids.
- The two blood-borne pathogens that are of concern in the workplace are Hepatitis B and the HIV virus that causes AIDS (Acquired Immune Deficiency Syndrome).
- Although the blood-borne pathogens for Hepatitis B and the HIV virus are found in all the body fluids listed above, the microorganisms in most of these fluids are not usually strong enough to be transmitted.
- In the workplace, blood is the body fluid most likely to transmit the microorganisms associated with Hepatitis B and the HIV virus.

How are blood-borne pathogens transmitted?

- HIV and Hepatitis B can be transmitted only if both of the following conditions are present.
  1. The blood to which you have been exposed is infectious.
  2. Infectious blood enters a direct route into your body.
- Direct routes of entry into your body include:
  1. Unprotected openings in the skin, such as cuts, scrapes, and dermatitis.
  2. Unprotected mucus-membrane openings, such as your eyes, nose, and mouth.
  3. Penetrations into the skin caused by sharp objects, such as broken glass, a needle, or a knife blade.

How can you prevent transmission of blood-borne pathogens?

The best way to prevent transmission of blood-borne pathogens if you are exposed to blood in the workplace is to practice the *universal precaution*—**Assume any blood you are exposed to is infectious and requires you to use protective measures and personal protective equipment when handling it.**

Student Supplement 3

What types of personal protective equipment should you wear when handling blood?

- Protective equipment such as gloves, gowns, glasses, and goggles act as a barrier between infectious blood and direct routes of entry into your body.

- Wear nonpermeable gloves in any situation where hand contact with blood is possible. Disposable latex gloves are most commonly used.

- Use more extensive protective equipment when cleaning up blood spills or when treating traumatic injuries that involve splashing or spraying of blood. In these situations, wear eye protection and a mask or wear a face shield and glasses or goggles to prevent blood from getting into your eyes, nose, or mouth. Wear gowns, aprons, and lab coats to keep blood from reaching your clothing.

- Use a resuscitation bag or pocket respirator with a one-way valve to protect yourself against infectious fluids that could be projected by the victim in a resuscitation (CPR) emergency.

- Use a broom and a dustpan or tongs to pick up blood-contaminated sharp objects from the floor. And, place blood-contaminated sharp objects in *sharps containers* (special red-orange color-coded, puncture-resistant, leak-proof containers).

- Blood spills must be cleaned up immediately, but do *not* attempt to clean blood spills yourself. Blood spills should be handled only by the designated personnel at your facility, and all materials used in the cleanup must be properly decontaminated and disposed of.

Basic Workplace Safety and First-Aid
Unit 4

Assignment Sheet 1—Complete a Safety Inspection

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	_____
Answers indicate student has grasped safety concepts and can identify hazardous situations	_____

Introduction: Stores, shops, and warehouses where parts specialists work have numerous areas where safety hazards can occur. Electrical systems, hazardous materials, paints, and solvents, storage areas with heavy objects on shelves, cutting and finishing tools, and general housekeeping habits all can have safety consequences for workers. In this assignment sheet your goal is to identify various safety hazards, whether they be in an actual place of business, in pictures supplied by your instructor or in an actual facility selected by your instructor.

Directions: Make a field trip to a parts store or use a facility or set of pictures selected by your instructor to conduct a safety inspection; circle the appropriate letter according to the following evaluation code:

S—Satisfactory (needs no attention)
A—Acceptable (needs some attention)
U—Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments.

General Physical Condition

1.	Machines, bins, and other equipment are arranged so as to conform to good safety practices	S	A	U
2.	Condition of stairways and ramps	S	A	U
3.	Condition of aisles	S	A	U
4.	Condition of floors	S	A	U
5.	Condition of walls, windows, and ceiling	S	A	U
6.	Illumination is safe, sufficient, and well placed	S	A	U
7.	Ventilation is adequate and proper for conditions	S	A	U
8.	Temperature control	S	A	U
9.	Fire extinguishers are proper type, adequately supplied, properly located, and maintained	S	A	U

Assignment Sheet 1

10.	Teacher and pupils know location of and how to use proper type of extinguisher for various fires	S	A	U
11.	Number and location of exits is adequate and properly identified	S	A	U
12.	Walls are clear of objects that might fall	S	A	U
13.	Utility lines are properly identified	S	A	U
14.	Evaluation of the total rating of **General Physical Condition**	S	A	U

Housekeeping

1.	General appearance as to orderliness	S	A	U
2.	Adequate and proper storage space for tools and materials	S	A	U
3.	Corners are clean and clear	S	A	U
4.	Special tool rack in orderly condition	S	A	U
5.	Supply and/or material room is orderly	S	A	U
6.	Sufficient scrap boxes are provided	S	A	U
7.	Scrap stock is put in scrap boxes promptly	S	A	U
8.	Materials are stored in an orderly and safe condition	S	A	U
9.	A spring lid metal container is provided for waste and oily rags	S	A	U
10.	Dangerous materials are stored in metal cabinets	S	A	U
11.	Machines have been safety color coded	S	A	U
12.	Safety cans are provided for flammable liquids	S	A	U
13.	Floors are free of oil, water, and foreign material	S	A	U
14.	Evaluation of the total rating for **Housekeeping**	S	A	U

Equipment

1.	Machines are arranged so that workers are protected from hazards of other machines and passing students	S	A	U
2.	Danger zones are properly indicated and guarded	S	A	U
3.	All gears and moving belts are protected by permanent enclosure guards	S	A	U
4.	All equipment control switches are easily available to operator	S	A	U
5.	Nonskid areas are provided around machines	S	A	U
6.	Tools are kept sharp, clean, and in safe working order	S	A	U
7.	Evaluation of the total rating for **Equipment**	S	A	U

Assignment Sheet 1

Electrical Installation

1.	All switches are enclosed	S	A	U
2.	There is a master control switch for all of the electrical installations	S	A	U
3.	All electrical extension cords are in safe condition and are not carrying excessive loads	S	A	U
4.	All machine switches are within easy reach of the operators	S	A	U
5.	Individual cut-off switches are provided for each machine	S	A	U
6.	No temporary wiring in evidence	S	A	U
7.	Evaluation of the total rating for **Electrical Installation**	S	A	U

Recommendations: ____

____

____

____

____

____

Basic Workplace Safety and First-Aid
Unit 4

Assignment Sheet 2—Interpret Material Safety Data Sheets

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
Directions have been followed	______
All questions have been answered correctly	______

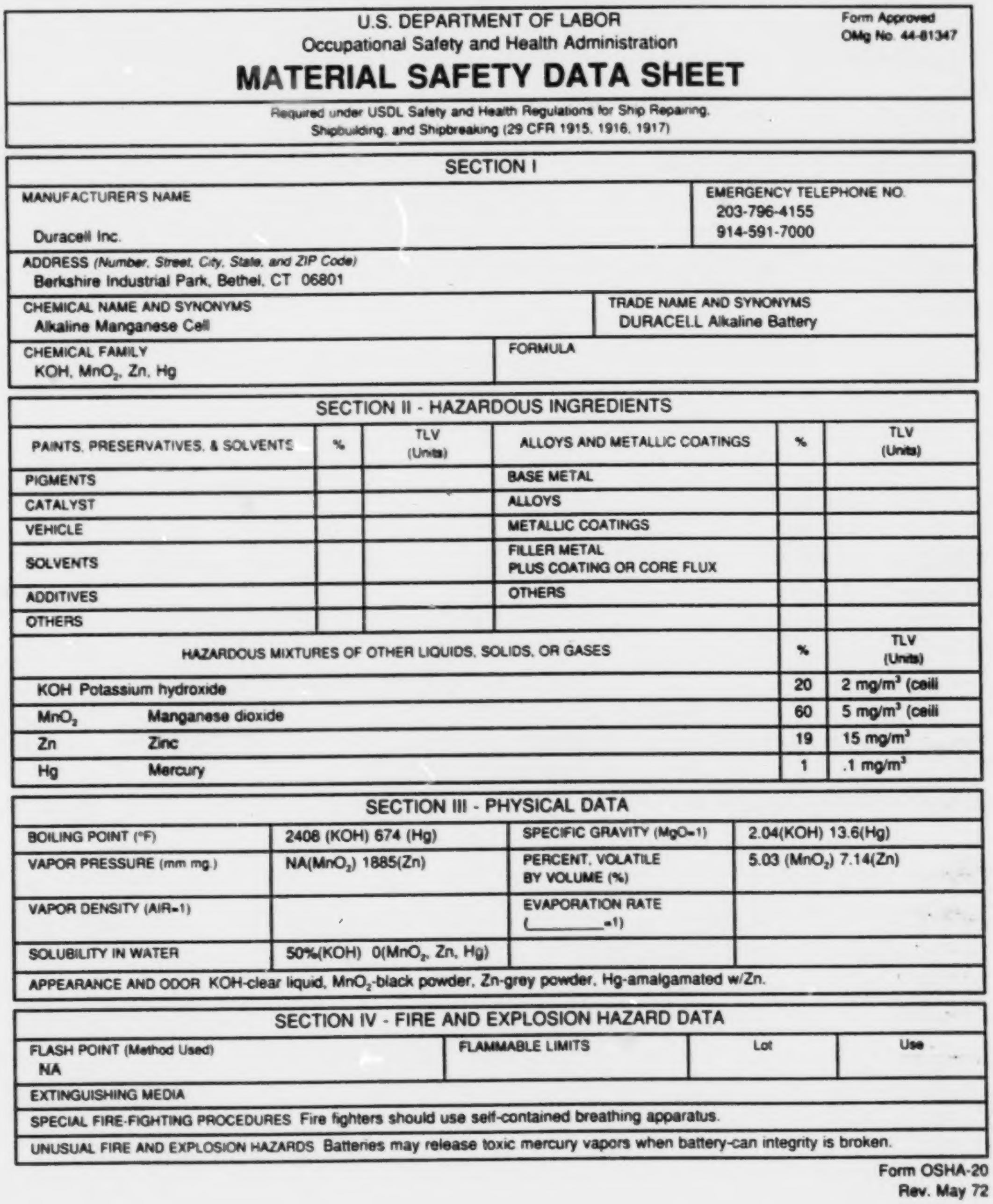
Introduction: It is important not only that all employees have access to MSDSs, but also that all employees know how to read and interpret the data on those forms.

Directions: Review the material in Objectives 6 and 7 of the information sheet, and locate and study the information presented in Student Supplement 1, "Guidelines for Interpreting Material Safety Data Sheets."

Next, study the MSDSs presented in this assignment. Use the MSDSs to answer the questions that follow. Write your answers on the blanks provided below each item.

Assignment Sheet 2

MSDS 1—Duracell Alkaline Battery



U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMg No. 44-81347

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME Duracell Inc.	EMERGENCY TELEPHONE NO. 203-796-4155 914-591-7000
ADDRESS *(Number, Street, City, State, and ZIP Code)* Berkshire Industrial Park, Bethel, CT 06801	
CHEMICAL NAME AND SYNONYMS Alkaline Manganese Cell	TRADE NAME AND SYNONYMS DURACELL Alkaline Battery
CHEMICAL FAMILY KOH, MnO_2, Zn, Hg	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
KOH Potassium hydroxide	20	2 mg/m^3 (ceili
MnO_2 Manganese dioxide	60	5 mg/m^3 (ceili
Zn Zinc	19	15 mg/m^3
Hg Mercury	1	.1 mg/m^3

SECTION III - PHYSICAL DATA

BOILING POINT (°F)	2408 (KOH) 674 (Hg)	SPECIFIC GRAVITY (MgO=1)	2.04(KOH) 13.6(Hg)
VAPOR PRESSURE (mm mg.)	NA(MnO_2) 1885(Zn)	PERCENT, VOLATILE BY VOLUME (%)	5.03 (MnO_2) 7.14(Zn)
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (________=1)	
SOLUBILITY IN WATER	50%(KOH) 0(MnO_2, Zn, Hg)		

APPEARANCE AND ODOR KOH-clear liquid, MnO_2-black powder, Zn-grey powder, Hg-amalgamated w/Zn.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used) NA	FLAMMABLE LIMITS	Lot	Use

EXTINGUISHING MEDIA

SPECIAL FIRE-FIGHTING PROCEDURES Fire fighters should use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS Batteries may release toxic mercury vapors when battery-can integrity is broken.

Form OSHA-20
Rev. May 72

Page *1* of *2*

Assignment Sheet 2

MSDS 1—Duracell Alkaline Battery

SECTION V - HEALTH HAZARD DATA
THRESHOLD LIMIT VALUE See section II
EFFECTS OF OVEREXPOSURE KOH is caustic. Skin contact can cause burns. Eye contact may cause permanent injury.
EMERGENCY AND FIRST-AID PROCEDURES If leakage from battery contacts the skin, flush immediately with water. For eye contact, flush with copious amounts of water for 15 minutes and see physician at once.

SECTION VI - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY *(Materials to avoid)*			
HAZARDOUS DECOMPOSITION PRODUCTS When heated, battery may emit hazardous vapors of KOH & Hg.			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Avoid skin and eye contact.
WASTE DISPOSAL METHOD Do not incinerate since battery may explode.

SECTION VIII - SPECIAL PROTECTION INFORMATION		
RESPIRATORY PROTECTION *(Specify type)*		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER
PROTECTIVE GLOVES	EYE PROTECTION	
OTHER PROTECTIVE EQUIPMENT		

SECTION IX - SPECIAL PRECAUTIONS
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING When handling leaking batteries, use neoprene, rubber, or latex nitrile gloves. Store at room temperature and in a dry place.
OTHER PRECAUTIONS Install batteries in accordance with equipment instructions. Do not recharge or dispose of in fire. Replace all batteries in equipment at the same time. Do not mix battery systems of different types, such as alkaline and zinc carbon batteries. Do not carry batteries loose in your pocket or carrying bag. Check batteries periodically when in use.

Form OSHA-20
Rev. May 72

Assignment Sheet 2

MSDS 1—Duracell Alkaline Battery

1. What potentially hazardous materials are contained in this product?

2. What unusual fire and explosion hazards can occur with this product?

3. What emergency and first-aid procedures should be taken if someone's skin or eye contacts leakage from this product?

4. What precautions should be taken for disposal of this product?

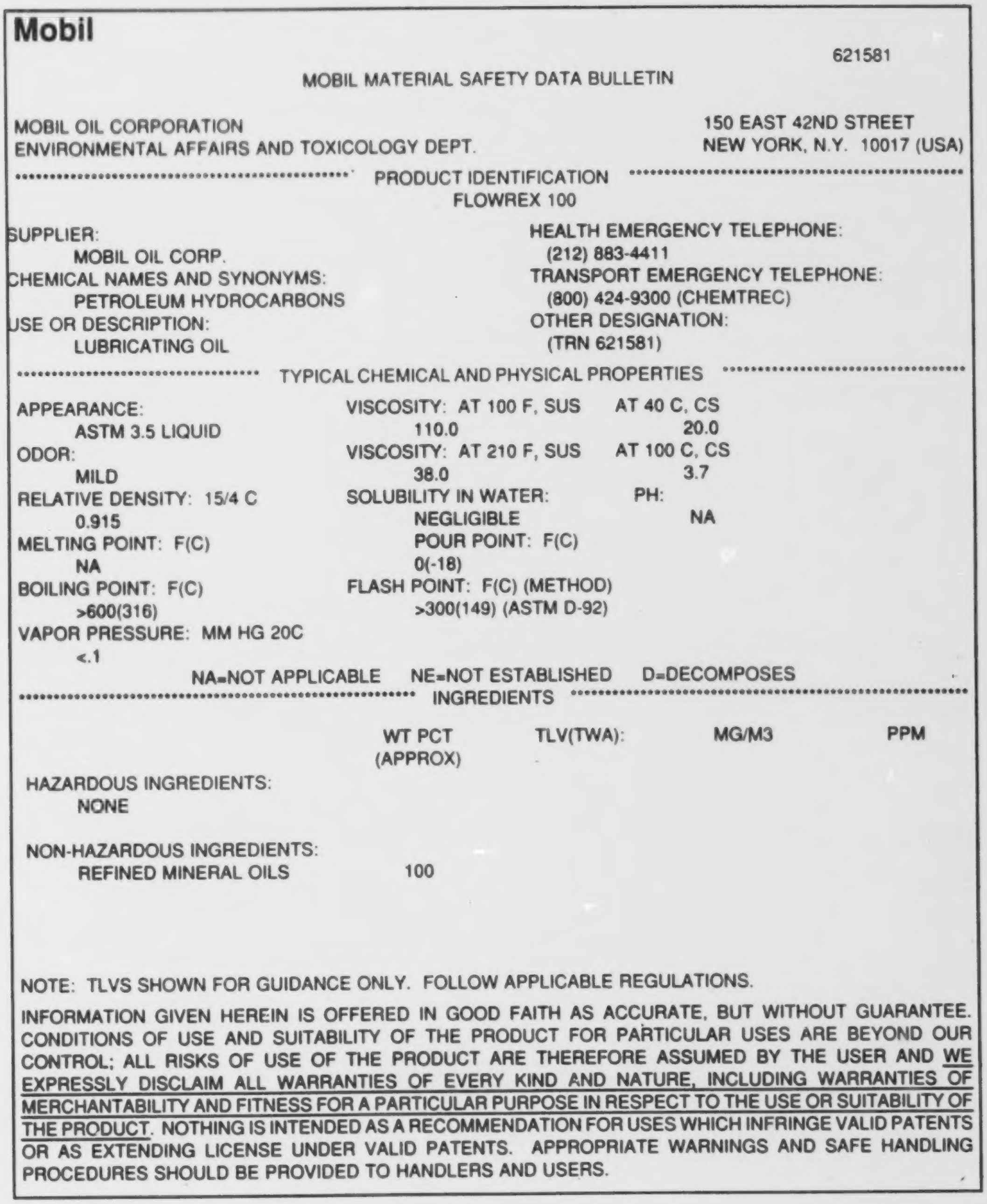
5. What precautions should be taken when handling and storing this product?

Assignment Sheet 2

6. What other special precautions should be taken when working with this product?

Assignment Sheet 2

MSDS 2—Mobil Lubricating Oil



Mobil

621581

MOBIL MATERIAL SAFETY DATA BULLETIN

MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPT.

150 EAST 42ND STREET
NEW YORK, N.Y. 10017 (USA)

PRODUCT IDENTIFICATION
FLOWREX 100

SUPPLIER: MOBIL OIL CORP.	HEALTH EMERGENCY TELEPHONE: (212) 883-4411
HEMICAL NAMES AND SYNONYMS: PETROLEUM HYDROCARBONS	TRANSPORT EMERGENCY TELEPHONE: (800) 424-9300 (CHEMTREC)
USE OR DESCRIPTION: LUBRICATING OIL	OTHER DESIGNATION: (TRN 621581)

TYPICAL CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE: ASTM 3.5 LIQUID	VISCOSITY: AT 100 F, SUS 110.0	AT 40 C, CS 20.0
ODOR: MILD	VISCOSITY: AT 210 F, SUS 38.0	AT 100 C, CS 3.7
RELATIVE DENSITY: 15/4 C 0.915	SOLUBILITY IN WATER: NEGLIGIBLE	PH: NA
MELTING POINT: F(C) NA	POUR POINT: F(C) 0(-18)	
BOILING POINT: F(C) >600(316)	FLASH POINT: F(C) (METHOD) >300(149) (ASTM D-92)	
VAPOR PRESSURE: MM HG 20C <.1		

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

INGREDIENTS

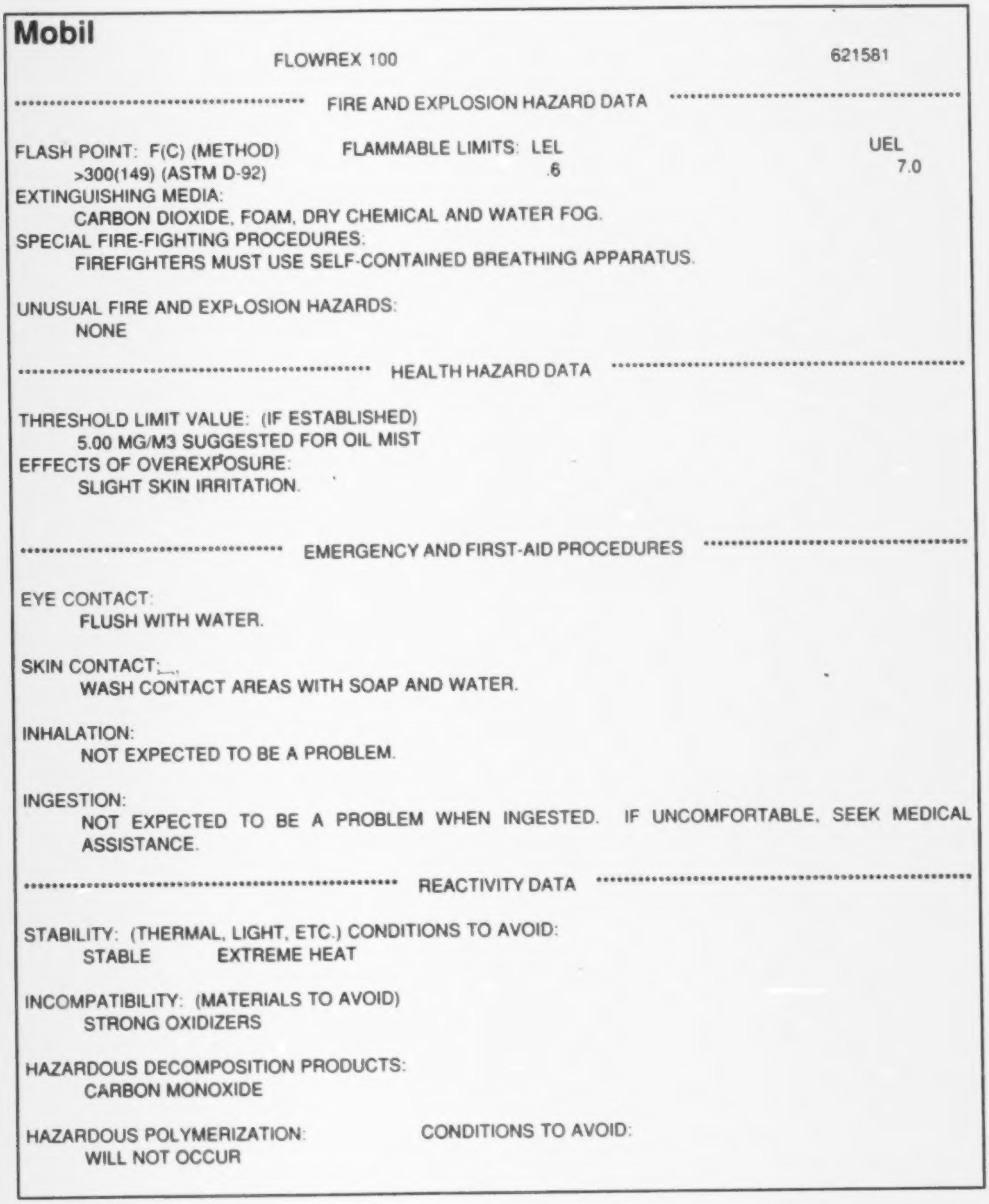
	WT PCT (APPROX)	TLV(TWA):	MG/M3	PPM
HAZARDOUS INGREDIENTS:				
NONE				
NON-HAZARDOUS INGREDIENTS:				
REFINED MINERAL OILS	100			

NOTE: TLVS SHOWN FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS.

INFORMATION GIVEN HEREIN IS OFFERED IN GOOD FAITH AS ACCURATE, BUT WITHOUT GUARANTEE. CONDITIONS OF USE AND SUITABILITY OF THE PRODUCT FOR PARTICULAR USES ARE BEYOND OUR CONTROL; ALL RISKS OF USE OF THE PRODUCT ARE THEREFORE ASSUMED BY THE USER AND WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT. NOTHING IS INTENDED AS A RECOMMENDATION FOR USES WHICH INFRINGE VALID PATENTS OR AS EXTENDING LICENSE UNDER VALID PATENTS. APPROPRIATE WARNINGS AND SAFE HANDLING PROCEDURES SHOULD BE PROVIDED TO HANDLERS AND USERS.

Assignment Sheet 2

MSDS 2—Mobil Lubricating Oil



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FLOWREX 100 621581

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: F(C) (METHOD) FLAMMABLE LIMITS: LEL UEL
>300(149) (ASTM D-92) .6 7.0

EXTINGUISHING MEDIA:
CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.

SPECIAL FIRE-FIGHTING PROCEDURES:
FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: (IF ESTABLISHED)
5.00 MG/M3 SUGGESTED FOR OIL MIST

EFFECTS OF OVEREXPOSURE:
SLIGHT SKIN IRRITATION.

EMERGENCY AND FIRST-AID PROCEDURES

EYE CONTACT:
FLUSH WITH WATER.

SKIN CONTACT:
WASH CONTACT AREAS WITH SOAP AND WATER.

INHALATION:
NOT EXPECTED TO BE A PROBLEM.

INGESTION:
NOT EXPECTED TO BE A PROBLEM WHEN INGESTED. IF UNCOMFORTABLE, SEEK MEDICAL ASSISTANCE.

REACTIVITY DATA

STABILITY: (THERMAL, LIGHT, ETC.) CONDITIONS TO AVOID:
STABLE EXTREME HEAT

INCOMPATIBILITY: (MATERIALS TO AVOID)
STRONG OXIDIZERS

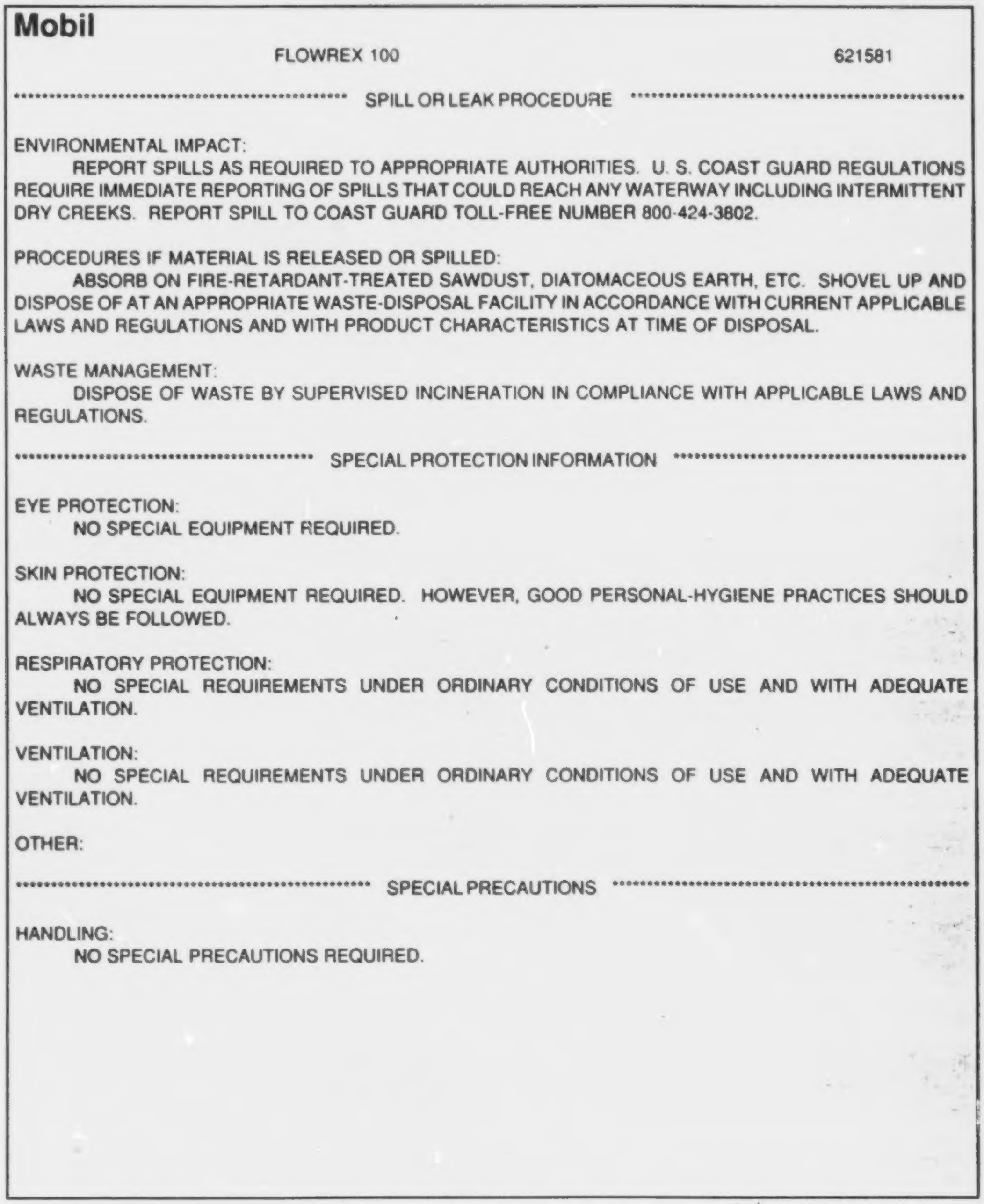
HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE

HAZARDOUS POLYMERIZATION: CONDITIONS TO AVOID:
WILL NOT OCCUR

Page 2 of 4

Assignment Sheet 2

MSDS 2—Mobil Lubricating Oil



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SPILL OR LEAK PROCEDURE

ENVIRONMENTAL IMPACT:
REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL-FREE NUMBER 800-424-3802.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
ABSORB ON FIRE-RETARDANT-TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE-DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS AND WITH PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.

WASTE MANAGEMENT:
DISPOSE OF WASTE BY SUPERVISED INCINERATION IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

SPECIAL PROTECTION INFORMATION

EYE PROTECTION:
NO SPECIAL EQUIPMENT REQUIRED.

SKIN PROTECTION:
NO SPECIAL EQUIPMENT REQUIRED. HOWEVER, GOOD PERSONAL-HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.

RESPIRATORY PROTECTION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

VENTILATION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

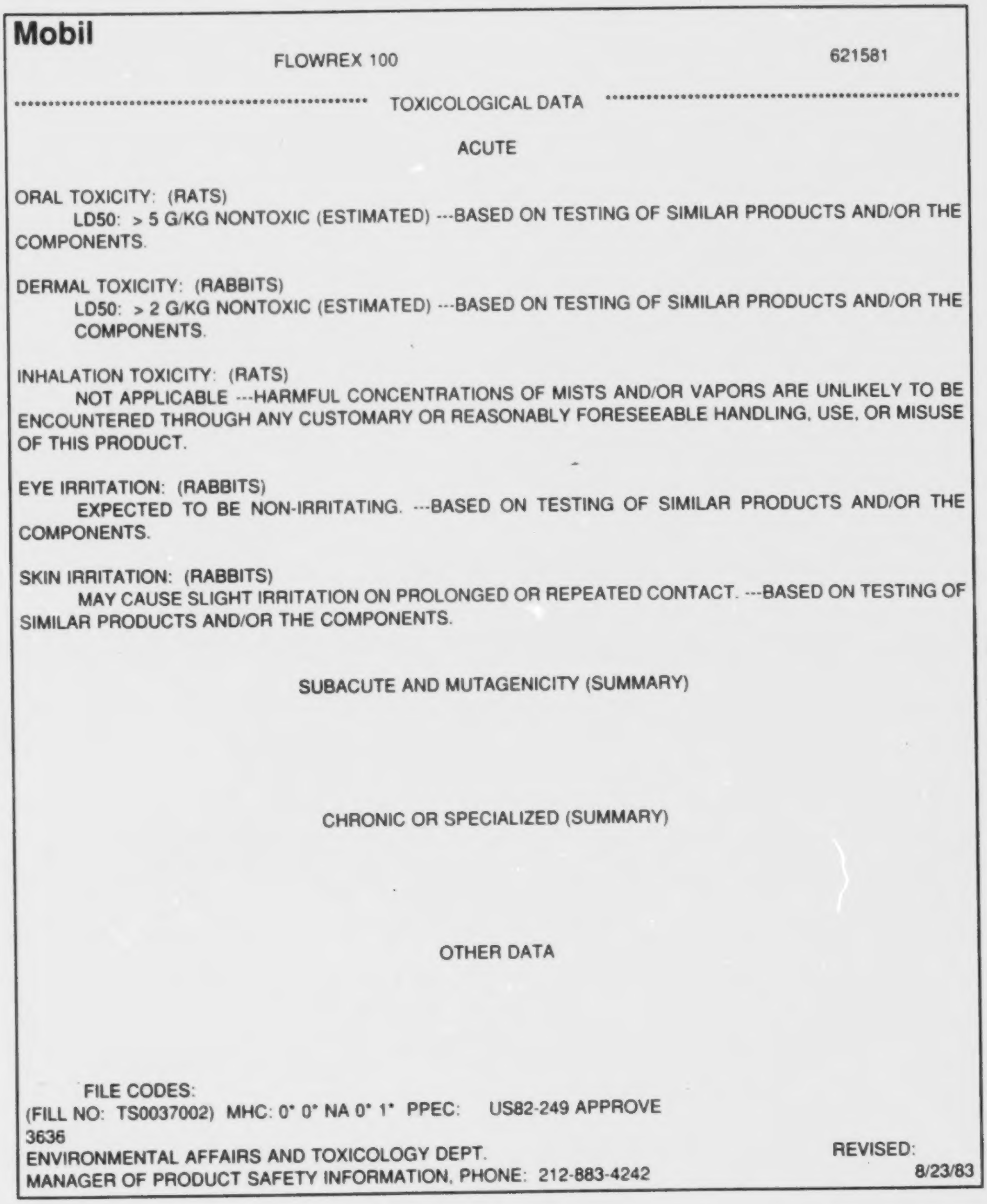
OTHER:

SPECIAL PRECAUTIONS

HANDLING:
NO SPECIAL PRECAUTIONS REQUIRED.

Assignment Sheet 2

MSDS 2—Mobil Lubricating Oil



Mobil

FLOWREX 100 621581

TOXICOLOGICAL DATA

ACUTE

ORAL TOXICITY: (RATS)
LD50: > 5 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

DERMAL TOXICITY: (RABBITS)
LD50: > 2 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

INHALATION TOXICITY: (RATS)
NOT APPLICABLE ---HARMFUL CONCENTRATIONS OF MISTS AND/OR VAPORS ARE UNLIKELY TO BE ENCOUNTERED THROUGH ANY CUSTOMARY OR REASONABLY FORESEEABLE HANDLING, USE, OR MISUSE OF THIS PRODUCT.

EYE IRRITATION: (RABBITS)
EXPECTED TO BE NON-IRRITATING. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SKIN IRRITATION: (RABBITS)
MAY CAUSE SLIGHT IRRITATION ON PROLONGED OR REPEATED CONTACT. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SUBACUTE AND MUTAGENICITY (SUMMARY)

CHRONIC OR SPECIALIZED (SUMMARY)

OTHER DATA

FILE CODES:
(FILL NO: TS0037002) MHC: 0* 0* NA 0* 1* PPEC: US82-249 APPROVE
3636
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPT.
MANAGER OF PRODUCT SAFETY INFORMATION, PHONE: 212-883-4242

REVISED:
8/23/83

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Assignment Sheet 2

MSDS 2—Mobil Lubricating Oil

1. What potentially hazardous materials are contained in this product?

2. What non-hazardous materials are contained in this product?

3. What effects result from overexposure to this product?

4. What emergency and first-aid procedures should be taken in each of the following situations?

Eye contact

Skin contact

Inhalation

BEST COPY AVAILABLE

Assignment Sheet 2

Ingestion

5. What material should be avoided when using this product?

6. What media should be used to extinguish fires involving this product?

7. What special procedures are required when fighting fires involving this product?

8. What procedures should be followed if this product is spilled?

Basic Workplace Safety and First-Aid Skills
Unit 4

Assignment Sheet 3—Analyze Scenarios to Determine Appropriate Safety Practices

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	_____
Answers indicate student has grasped safety concepts and knows how to respond to hazardous situations	_____

Introduction: As a parts specialist you will find yourself confronted with numerous safety-related incidents throughout your career. From electrical systems and hazardous materials, to fires and personal injury, you may be called upon to respond to a number of emergencies. This assignment allows you to go through some typical emergencies mentally and give the correct response based on the information presented in this unit.

Directions: Read the following scenarios and select the correct response. If none of the answers are correct, write in the correct response on the blanks provided.

1. You are washing down the garage floor of an auto lubrication bay with a garden hose connected to the shop water heater. A co-worker has just disconnected a fuel filter from a fuel-injected minivan in the adjacent bay and the pressurized system has caused a considerable fuel spill. As your co-worker hurries to gather rags to clean up the spill he breaks a trouble light near the spill which ignites it. He is out of the way but the fire has spread across the floor and has jumped back into the engine compartment of the vehicle.

   You should:

   ______a. Immediately drench the blaze with the garden hose.

   ______b. Immediately close the hood of the burning vehicle to snuff out the fire.

   ______c. Drop the hose and secure a Class A fire extinguisher to extinguish the fire.

   ______d. ____

   ____

   ____

Assignment Sheet 3

2. While charging a lead/acid battery in a lawn tractor brought in by a customer, you inadvertently splash battery acid on your hand and shirt sleeve.

You should:

______a. Wipe the acid off immediately with a rag or on your pant leg.

______b. Smear grease on your hand where it was affected by the acid.

______c. Flush the hand and shirt sleeve with generous amounts of water.

______d. ____

____

____

3. A customer has brought a snow blower that will not start to your shop. Snow is predicted and the temperatures are already in the low 20s. Your best guess is the battery is functional but severely discharged. Also, you notice ice crystals in the electrolyte when you check its level.

You should:

______a. Immediately connect a battery charger to the battery to get it in shape for the coming storm and satisfy your customer.

______b. Allow the battery to thaw to room temperature before charging.

______c. Pour hot distilled water into the battery to thaw it before charging.

______d. ____

____

____

Assignment Sheet 3

4. In a business involving an office, a warehouse, a machine shop with electrical tools and lubricants, which of the following would represent the minimum number of fire extinguishers required for adequate response to possible fires?

______a. 1 multipurpose dry chemical fire extinguisher

______b. A Class A fire extinguisher and a dry chemical fire extinguisher rated for B, C, and D fires

______c. A soda/acid fire extinguisher for paper fires, and a dry chemical fire extinguisher for B, C, and D fires

______d. ____

____

____

5. What safety equipment should always be used when working with lead/acid batteries found in automobiles and lawn and garden equipment?

______a. A ground-fault interrupter circuit breaker

______b. A negative-ground polarity meter

______c. Steel-toed safety shoes

______d. ____

____

____

6. Your co-worker is searching for a radiator petcock on a customer's car and inadvertently grasps the top of the cooling fan shroud, just as the automatically-operated electric fan comes on. The fan blades severely cut two of her fingers.

The proper action in this case is:

______a. Pack the cuts with first-aid cream

______b. Immediately wrap the cuts with the nearest clean shop towel available

______c. Call 911

______d. ____

____

____

Basic Workplace Safety and First-Aid Skills
Unit 4

Job Sheet 1—Lift a Heavy Object Properly

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Load was safely lifted	______
Load was safely carried and set down	______

Note: When you are ready to perform this task, ask your instruction to observe the procedure and rate your performance using the above criteria.

A. Introduction

The number-one worker injury in America today is back strain or injury. Most of these injuries come from trying to lift an object that is too heavy or from lifting an object improperly. It is very important, therefore, that you learn to assess the weight of a load to be lifted, and either get help to lift the load or lift the load properly, using your leg muscles, not your back.

B. Equipment and Materials

- Large, heavy box
- Gloves
- Lower-back support belt

C. Procedure

☐ 1. Put on gloves and lower-back support belt.

☐ 2. Size up the load.

☐ 3. Place your feet close to the object and 8 to 12 inches apart for good balance.

☐ 4. Bend your knees to a degree that is comfortable.

☐ 5. Grip the box firmly with both hands.

Job Sheet 1

☐ 6. Keeping your back straight and using your leg muscles, lift the box to waist height and hold close to your body.

Caution: Do not make any turning or twisting motions until the lift is complete.

☐ 7. Turn by changing foot position, making sure that your path is clear.

☐ 8. Carry the box to the new location, using a normal walking gait and keeping your view unobstructed.

☐ 9. Reverse the lifting procedure to set the box down, taking care to bend your knees, keep your back straight, and avoid setting the box on your fingers or feet.

Evaluator's comments: ______________________________

____

____

Basic Workplace Safety and First-Aid Skills
Unit 4

Job Sheet 2—Place and Climb a Ladder Safely

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	Rating
Ladder was picked up correctly and safely	______
Ladder was carried correctly and safely	______
Ladder was placed correctly and safely (1 foot from wall for every 4 feet of ladder height; at least three rungs above work)	______
Ladder was climbed and descended safely	

Note: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Introduction

To avoid falls and strains, correct and thoughtful placement of a ladder is very important. The ladder should be lifted correctly, and placed so that its base is at least a foot from the wall for each 4 feet of height. The ladder should also be placed close enough to the work so that the user does not need to stretch to reach the work.

B. Equipment and Materials

- One 12-foot straight ladder
- Class member to heel ladder

C. Procedure

☐ 1. Kneel beside the ladder, facing its top at about midpoint, knee closest to ladder on the ground.

☐ 2. Reach across the ladder and grasp the rung opposite close to the far siderail.

☐ 3. Stand up—using your legs, not your back.

Job Sheet 2

☐ 4. As you stand, pivot toward the other end of the ladder, slip your free arm between convenient rungs, and lift the ladder so that its top beam rests on your shoulder.

☐ 5. Carry the ladder to the work area, taking care to avoid bumping it into anything or anyone.

☐ 6. Check the work area for overhead electrical obstructions.

☐ 7. Slip the ladder from your shoulder, and rest it against the wall.

☐ 8. Adjust the ladder placement.

  ☐ a. Make sure shoes are secure on a flat surface.

  ☐ b. Check base to see if it is approximately 1 foot from the wall for each 4 feet of ladder height.

  ☐ c. Make sure top of ladder is at least three rungs above the work.

☐ 9. Ask a classmate to heel the ladder.

☐ 10. Climb the ladder to the work.

  ☐ a. Face the ladder.

  ☐ b. Place hands on rungs or siderails.

  ☐ c. Place feet squarely on rungs.

☐ 11. Descend the ladder.

  ☐ a. Face the ladder.

  ☐ b. Place hands on rungs or siderails.

  ☐ c. Place feet squarely on rungs.

Evaluator's comments: ____

____

____

Applied Math for Parts Specialists
Unit 5

Objective Sheet

Unit Objective

After completing this unit, the student should be able to solve basic math problems and use a decimal equivalent chart and an English-Metric conversion chart. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms associated with applied math to their correct definitions.
2. Match symbols used in math problems with their names.
3. Label the place values of a whole number.
4. Add whole numbers. (Assignment Sheet 1)
5. Subtract whole numbers. (Assignment Sheet 2)
6. Multiply whole numbers. (Assignment Sheet 3)
7. Divide whole numbers. (Assignment Sheet 4)
8. Distinguish among types of fractions.
9. Reduce fractions to lowest terms. (Assignment Sheet 5)
10. Convert fractions and mixed numbers. (Assignment Sheet 6)
11. Add fractions. (Assignment Sheet 7)
12. Subtract fractions. (Assignment Sheet 8)
13. Multiply fractions. (Assignment Sheet 9)
14. Label the place values of a decimal number.
15. Add decimal numbers. (Assignment Sheet 10)
16. Subtract decimal numbers. (Assignment Sheet 11)

Objective Sheet

17. Multiply decimal numbers. (Assignment Sheet 12)
18. Divide decimal numbers. (Assignment Sheet 13)
19. Discuss the two methods of expressing fractions and decimal equivalents.
20. List the three purposes of a decimal equivalent chart.
21. Use a decimal equivalent chart. (Assignment Sheet 14)
22. Convert fractions and percentages. (Assignment Sheet 15)
23. Solve percentage problems. (Assignment Sheet 16)
24. Compute discounts and sales prices. (Assignment Sheet 17)
25. Match metric prefixes with their values.
26. Use an English-Metric conversion chart. (Assignment Sheet 18)

Applied Math for Parts Specialists
Unit 5

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Review the suggested supplemental resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Arrange for a local parts dealer to visit the class to discuss this unit and its application to the work of a parts specialist.
- Arrange for a math teacher to visit the class to cover the basics of the four math functions and the use of fractions and decimals.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms associated with applied math to their correct definitions.

- Read and discuss terms and definitions. Ask students to give examples for each common math term.

Objective 2 Match symbols used in math problems with their names. **Objective 3** Label the place values of a whole number.

- Play "You Inherit" with students to help them learn place values. Ask students to tell you the least amount they inherit when you give them the amount in numbers of digits. **(Creative thinking; math)**

  Example:

  Q: "You have just inherited a six-digit sum. What is the least amount you inherit?"

  A: One hundred thousand dollars

Objective 4 Add whole numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 1. **(Reading/listening for content; math)**
- For Objectives 4 through 7, create or purchase sets of flashcards for the various math functions. Use the cards to evaluate students and determine what areas they need more practice with. **(Math)**

Objective 5 Subtract whole numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 2. **(Reading/listening for content; math)**

Objective 6 Multiply whole numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 3. **(Reading/listening for content; math)**

Suggested Activities

Objective 7 Divide whole numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 4. **(Reading/listening for content; math)**

Objective 8 Distinguish among types of fractions.

- Call out various types of fractions and have students tell whether they are proper, improper, or mixed. **(Math; reading/listening for content)**

Objective 9 Reduce fractions to lowest terms.

- Read and discuss the objective, then have students complete Assignment Sheet 5. **(Reading/listening for content; math)**

Objective 10 Convert fractions and mixed numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 6. **(Reading/listening for content; math)**

Objective 11 Add fractions.

- Read and discuss the objective, then have students complete Assignment Sheet 7. **(Reading/listening for content; math)**

Objective 12 Subtract fractions.

- Read and discuss the objective, then have students complete Assignment Sheet 8. **(Reading/listening for content; math)**

Objective 13 Multiply fractions.

- Read and discuss the objective, then have students complete Assignment Sheet 9. **(Reading/listening for content; math)**

Objective 14 Label the place values of a decimal number.

- Read and discuss the objective. Give students some practice numbers to label.

Suggested Activities

Objective 15 Add decimal numbers.

- Read and discuss the objective.

  Assign monetary values to each letter of the alphabet: A=$.05, B=$.10, C=$.15, D=$.25, E=$1.00 . . . Z=$20.00. Then have students calculate such problems as who has the most valuable name? What model car has the most valuable name? What soft drink has the most valuable name? **(Math)**

- Have students complete Assignment Sheet 10.

Objective 16 Subtract decimal numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 11. **(Reading/listening for content; math)**

Objective 17 Multiply decimal numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 12. **(Reading/listening for content; math)**

Objective 18 Divide decimal numbers.

- Read and discuss the objective, then have students complete Assignment Sheet 13. **(Reading/listening for content; math)**

Objective 19 Discuss the two methods of expressing fractions and decimal equivalents.

- Use Transparency 2 to show examples of fractional and decimal equivalents.

Objective 20 List the three purposes of a decimal equivalent chart.

- Use Transparency 1 to explain the decimal equivalent chart and discuss its uses.

Suggested Activities

Objective 21 Use a decimal equivalent chart.

- Read and discuss how to use a decimal equivalent chart, then have students complete Assignment Sheet 14. **(Reading/listening for content; math)**
- Obtain a quantity of pocket-sized decimal equivalent charts from a local parts supplier. Give one to each student.

Objective 22 Convert fractions and percentages.

- Read and discuss the objective. **(Reading/listening for content; math)**
- Illustrate percentages by providing students with graph or grid paper. Have students outline at least eight 10-by-10 block squares. Since each block contains 100 units or small squares, students can shade in enough units to illustrate 25 percent, 33⅓ percent, 50 percent, 96 percent, and so on.
- Have students complete Assignment Sheet 15. **(Math)**

Objective 23 Solve percentage problems.

- Read and discuss the objective, then have students complete Assignment Sheet 16. **(Reading/listening for content; math)**

Objective 24 Compute discounts and sales prices.

- Read and discuss objective. Show examples of product discounts/sales prices. **(Reading/listening for content; math)**
- Have students complete Assignment Sheet 17. **(Math)**

Objective 25 Match metric prefixes with their values.

- Discuss with students the importance of metric prefixes and how they relate to metric measurement.

Objective 26 Use an English-Metric conversion chart.

- Read and discuss objective. Use Transparencies 3 and 4 to show students how to use the chart. Give examples of problems that are relevant to parts industry. **(Reading/listening for content; math)**

Suggested Activities

- Have students complete Assignment Sheet 18. **(Math)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores on the "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Bernstein, Allen L. and David W. Wells. *Trouble-Shooting* Mathematics Skills. New York: Holt, Rinehart and Winston Inc.
- *Introduction to Automotive Service*, Unit A-4, "Apply Related Math and Measuring." Stillwater, OK: Curriculum and Instructional Materials Center/Oklahoma Department of Vocational and Technical Education, 1989.
- Lennes, N. J. and L. R. Travers. *Essentials of Arithmetic.* Dallas, TX: Laidlaw Brothers.
- Schumacher, Herman G. *Vocational Mathematics (Shop Arithmetic), Vol. 1.* Chicago, IL: Goodheart-Willcox, Inc.
- Slade, Margolis, and Boyce. *Mathematics for Technical and Vocational Schools*, 8th ed. New York: John Wiley and Sons, 1989.

Suggested Supplemental Resource

- Kit: *How to Survive Fractions, Decimals, and Percents.*

Note: Print kit includes teacher's guide, two answer key booklets, heavy duty activity cards, and storage case. The software kit includes 400 math word problems in fractions, decimals, and percents to supplement the print kit. Order from EBSCO Curriculum Materials, Division of EBSCO Industries, Inc., Box 281, Chelsea, AL 35043-0281, or call 1-800-633-8623.

Applied Math for Parts Specialists
Unit 5

Answers to Assignment Sheets

Assignment Sheet 1

A.
1. 11
2. 16
3. 13
4. 23
5. 108
6. 88
7. 242
8. 1,538
9. 1,197
10. 16,430

B.
1. a. 14
   b. 18
2. 56
3. 31
4. $352
5. 36
6. 58
7. a. 20
   b. 20
   c. 26
   d. 24
   e. 19

Assignment Sheet 2

A.
1. 4
2. 7
3. 53
4. 406
5. 424
6. 283
7. 1,175
8. 1,810
9. 51,450
10. 89,722

B.
1. $54
2. 11
3. 20
4. 948
5. Week 1 — 780 miles
   Week 2 — 1089 miles
   Week 3 — 1988 miles
   Week 4 — 1089 miles
   Week 5 — 1936 miles

Assignment Sheet 3

A.
1. 42
2. 72
3. 324
4. 2,884
5. 8,410
6. 2,028
7. 21,291
8. 165,478
9. 503,605
10. 5,458,852

Answers to Assignment Sheets

B.
1. 144
2. 50
3. 420
4. $425
5. $180
6. 700
7. 6,000
8. 520

Assignment Sheet 4

A.
1. 4
2. 8
3. 91
4. 312
5. 3
6. 3
7. 62, R4
8. 2, R97
9. 1, R365
10. 3, R634

B.
1. $3
2. $7
3. 21
4. $440
5. 4
6. $35

Assignment Sheet 5

A. 1/2
B. 1/2
C. 1
D. 1/4
E. 1/4
F. 3/8
G. 1/2
H. 1/2
I. 3/4
J. 1/2

Assignment Sheet 6

A.
1. P
2. M
3. I
4. M
5. P
6. I
7. I
8. M
9. I
10. M
11. M
12. I
13. I
14. P
15. M

B.
1. 1 3/4
2. 9/2
3. 31/4
4. 17/2
5. 49/8
6. 11/2
7. 17/4
8. 17/2
9. 37/4
10. 33/2

C.
1. 1 3/4
2. 4 1/2
3. 1 1/2
4. 1 7/8
5. 1 3/16
6. 1 3/8
7. 2 11/32
8. 2 1/2
9. 3 3/4
10. 2 1/16

Assignment Sheet 7

A.
1. 3/4
2. 1 1/2
3. 1/2
4. 1
5. 1 3/16
6. 25/32
7. 29/32
8. 1 1/4
9. 1 5/16
10. 1 25/32

B.
1. 7 3/4
2. 6 13/16

Answers to Assignment Sheets

Assignment Sheet 8

A.
1. 9/16
2. 5/8
3. 3/16
4. 5/32
5. 3/4
6. 9/16
7. 1/16
8. 3/8
9. 17/32
10. 1/2

B.
1. 3 1/4
2. 6 1/16
3. 31 19/32
4. 174 1/5
5. 11 3/64

C.
1. 2/3
2. 1 5/8
3. 8 1/8
4. 1 11/32
5. 25 11/16
6. 7 1/4
7. 9/16
8. 1 1/16
9. 2/3
10. 38 9/16

D.
1. 2/5
2. 49 15/16
3. 5 2/3
4. 9 1/2
5. 27 1/8
6. 2 1/4
7. 2 1/8
8. 3 5/16
9. 2 1/2
10. 3 3/16

E.
1. 1/8

2. 3/4

Assignment Sheet 9

A. 3/8
B. 15/128
C. 3 3/8
D. 3 1/4
E. 7/12
F. 1 1/2
G. 1/24
H. 16 27/32
I. 15/32
J. 21 1/4

Assignment Sheet 10

A.
1. Tenths
2. Hundredths
3. Hundred thousandths
4. Ten thousandths
5. Thousandths

B.
1. Hundredths
2. Ten thousandths
3. Tenths
4. Thousandths
5. Hundredths

Answers to Assignment Sheets

C.
1. $46.3\underline{8}26$
2. $35.003\underline{8}$
3. $148.\underline{2}96$
4. $6758.2\underline{3}$
5. $91.40\underline{8}2$
6. $2\underline{0}4.37$
7. $1\underline{4}.0079$
8. $208.0\underline{9}7$
9. $5.23\underline{9}81$
10. $502.\underline{9}67$
11. $5230.86\underline{7}$
12. $58\underline{7}.029$
13. $0.2\underline{9}8$
14. $3\underline{2}9.768$
15. $52.69\underline{4}$
16. $498.\underline{2}76$
17. $0.529\underline{6}$
18. $\underline{4}68.539$
19. $324.\underline{0}6$
20. $56\underline{7}.8$

D.

1. $$\begin{array}{r} 0.024 \\ +\ 0.165 \\ \hline 0.189 \end{array}$$

2. $$\begin{array}{r} 87.3 \\ +\ 370.0 \\ \hline 457.3 \end{array}$$

3. $$\begin{array}{r} 15.127 \\ 3.4 \\ .0091 \\ +\ 236.87 \\ \hline 255.4061 \end{array}$$

4. $$\begin{array}{r} 195.7 \\ 83.0 \\ +\ \ 9.0006 \\ \hline 287.7006 \end{array}$$

5. $$\begin{array}{r} .5280 \\ 435. \\ 179.50 \\ +\ \ 1.9 \\ \hline 616.9280 \end{array}$$

E.
1. $39.00
2. $74:33
3. 23.9
4. 24.8
5. $158.21

Assignment Sheet 11

A.
1. 351.98
2. 547.144
3. 141.013
4. 508.16
5. $749.25
6. $4.15
7. 670.4
8. 4,107.34
9. $2.47
10. $197.45

B.
1. $3317.32
2. 14.5
3. 40.5
4. $64.99
5. 18.25

Answers to Assignment Sheets

Assignment Sheet 12

A.
1. 8.184
2. 39.6
3. 1.1475
4. 297.5
5. 100.32
6. 6.4584
7. 0.4565
8. 25.38
9. 0.00069
10. 22.6352

B.
1. $42.34
2. $6187.50
3. .78
4. $16.95
5. 188.6

Assignment Sheet 13

A.
1. 9
2. 12.4
3. 33
4. 153
5. 1.5
6. 284
7. 0.8
8. 0.5
9. 300
10. 0.4

B.
1. $8.64
2. 35
3. 32
4. $21.60
5. 40.27

Assignment Sheet 14

A.
1. .0625
2. .875
3. .250
4. .500
5. .5625

B.
1. 7/16
2. 5/16
3. 3/8
4. 1/8
5. 11/16

Assignment Sheet 15

A.
1. 0.125
2. 0.25
3. 0.5
4. 0.75
5. 0.625
6. 0.0625
7. 0.09375
8. 0.875
9. 0.5625
10. 0.9375

B.
1. 25%
2. 50%
3. 70%
4. 75%
5. 100%
6. 10%
7. 87.5%
8. 50%
9. 33.3%
10. 62.5%

C.
1. g
2. j
3. d
4. a
5. i
6. b
7. c
8. f
9. h
10. e

Answers to Assignment Sheets

D.
1. 63.9
2. 5.93
3. 5.093
4. 5.0093
5. 3.825
6. 38.95
7. 38.095
8. 43.3
9. 402.3
10. 897.00097

E.
1. 1/2
2. 1/4
3. 1/3
4. 9/25
5. 7/25
6. 1/7
7. 21/100
8. 3/4
9. 2/3
10. 7/10

F.
1. .47
2. .15
3. .333
4. .62
5. .75
6. .03
7. .168
8. .09
9. .10
10. .50

Assignment Sheet 16

A.
1. All work completed
2. 25%, 5%
3. 94%
4. 6, 6%
5. 89%
6. 94%
7. 40%
8. 25%
9. 60%
10. 7%

B.
1. 2.16
2. 0.9
3. 32
4. 50
5. 43.18
6. 17.6
7. 1.03
8. 57
9. 16.4
10. 11.41

C.
1. 12
2. 1
3. $24.00
4. 600

Answers to Assignment Sheets

Assignment Sheet 17

A. $135.95

B. $384.95

C. 1. $287.00
   2. $63.00

D. 1. $144.00
   2. $9.00

E. $71.60

F. $7.00

G. $5.00

H. 33⅓%

I. $36.00

J. $38.25

Assignment Sheet 18

A. 26 gallons
B. 84.755
C. 4.575 meters

Applied Math for Parts Specialists
Unit 5

Answers to Written Test

1.	a.	1	e.	6	i.	11	m.	14
	b.	2	f.	15	j.	8	n.	3
	c.	4	g.	9	k.	12	o.	7
	d.	5	h.	10	l.	13		
2.	a.	10	d.	5	g.	3	j.	9
	b.	2	e.	4	h.	7		
	c.	6	f.	8	i.	1		
3.	a.	Millions						
	b.	Hundred thousands						
	c.	Ten thousands						
	d.	Thousands						
	e.	Hundreds						
	f.	Tens						
	g.	Units						
4.	a.	11	d.	1,797				
	b.	20	e.	21,085				
	c.	128						
5.	a.	2	d.	342				
	b.	26	e.	1,119				
	c.	402						
6.	a.	35	d.	348,513				
	b.	612	e.	5,568,066				
	c.	49,980						
7.	a.	12	d.	2				
	b.	4	e.	14, R131				
	c.	16	f.	152, R400				
8.	a.	P	d.	M	g.	P	j.	I
	b.	M	e.	M	h.	M		
	c.	I	f.	P	i.	P		
9.	a.	1/2	d.	1/4	g.	1/8	j.	31/32
	b.	1/2	e.	3/8	h.	1/8		
	c.	7/16	f.	1/4	i.	3/4		

Answers to Written Test

10. a. (1) 7/2
    (2) 9/2
    (3) 15/4
    (4) 25/2
    (5) 429/32

    b. (1) 5 7/8
    (2) 2 1/3
    (3) 4 16/23
    (4) 10 4/5
    (5) 16

11. a. 3/4
    b. 1
    c. 1 1/4
    d. 1
    e. 1
    f. 1 1/4
    g. 9 3/8
    h. 19 5/8
    i. 12 3/4
    j. 11 1/4

12. a. 1/8
    b. 1/2
    c. 5/16
    d. 1/8
    e. 1/4
    f. 0
    g. 1 1/2
    h. 3 5/8
    i. 5
    j. 5 5/8

13. a. 3/8
    b. 9/32
    c. 3/32
    d. 4 7/8
    e. 59 1/16
    f. 10 11/16
    g. 24 1/16

14. a. Tenths
    b. Hundredths
    c. Thousandths
    d. Ten thousandths
    e. Hundred thousandths
    f. Millionths

15. a. 15.6
    b. 5.346
    c. $20.63
    d. 132.003
    e. 6735.2613

16. a. $3.90
    b. $3.08
    c. $6.75
    d. 0.585325
    e. 0.25

17. a. 12.22
    b. 0.00595
    c. 0.72
    d. 680.58144
    e. 7.22

18. a. 13.3
    b. 139
    c. 31
    d. 3.07
    e. 0.15
    f. 120
    g. 600
    h. 9,000
    i. 14,000
    j. 105.375

Answers to Written Test

19. Answer may be in student's own words but should address the following:

    These may be expressed by word or number.
    Word — May be a written or verbal form of expression
    Number — Using numerators, denominators, whole numbers, mixed numbers, etc. to signify an expression

20. a. Convert fractions to decimals
    b. Convert decimals to fractions
    c. Establish standard for unit conversion

21. a. .125
    b. .78125
    c. .375
    d. .9375
    e. .500
    f. 7/32
    g. 9/16
    h. 3/4
    i. 7/8
    j. 5/64

22. a. (1) 3/50
       (2) 11/20
       (3) 9/100
       (4) 13/20
       (5) 37/40

    b. (1) 0.12; 3/25
       (2) 0.30; 3/10
       (3) 0.45; 9/20
       (4) 0.72; 18/25
       (5) 2.50; 2 1/2

23. a. $22.41
    b. 6 items
    c. 20 percent

24. a. 25%
    b. 30%
    c. 15%
    d. $17.95
    e. $4.80

25. a. 3
    b. 5
    c. 4
    d. 6
    e. 2
    f. 1

26. a. 96.54 kilometers
    b. 9.1 kilograms

Applied Math for Parts Specialists
Unit 5

Written Test

Name ______________________________ Score ______________

1. Match terms associated with applied math to their correct definitions. Write the correct numbers in the blanks.

_____a. Process of totaling two or more numbers to find another number called a sum

_____b. Fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

_____c. Any one of the ten symbols, 0 to 9, by which all numbers can be expressed

_____d. Opposite (inverse) operation of multiplication

_____e. Part of a whole; represents one or more equal parts of a unit

_____f. Any of the natural numbers, both positive and negative, that represents a complete item

_____g. Abbreviated process of adding a number to itself a specified number of times

_____h. Top number of a fraction

_____i. One part in a hundred; reckoned on the basis of a whole divided into one hundred parts

_____j. Metric unit used to measure length

_____k. Being relatively equal in size or quantity

_____l. Relationship in quantity, amount, or size between two or more things

_____m. Opposite (inverse) operation of addition

_____n. Base or lower number of a fraction

_____o. Metric unit used to measure capacity

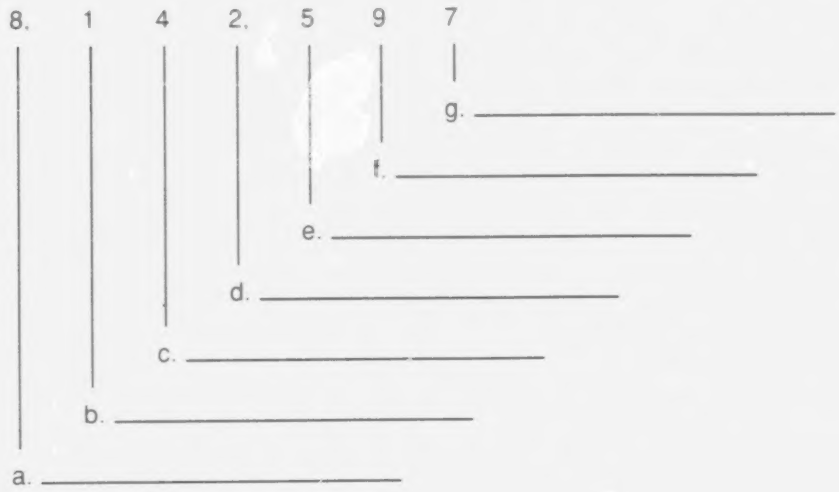
1. Addition
2. Decimal
3. Denominator
4. Digit
5. Division
6. Fraction
7. Liter
8. Meter
9. Multiplication
10. Numerator
11. Percent
12. Proportional
13. Ratio
14. Subtraction
15. Whole number (integer)

Written Test

2. Match symbols used in math problems with their names. Write the correct numbers in the blanks.

_______a.	Plus sign (addition)	1. .
_______b.	Pi sign	2. π
_______c.	Equal sign	3. %
_______d.	Division frame	4. :
_______e.	Ratio symbol	5. ⟌
_______f.	Minus sign (subtraction)	6. =
_______g.	Percent symbol	7. x
_______h.	Times sign (multiplication)	8. –
_______i.	Decimal point	9. ÷
_______j.	Division sign	10. +

3. Label the place values of the whole number below.



Written Test

4. Add whole numbers to solve the following problems. Show your work.

a. $\begin{array}{r} 2 \\ +\ 9 \\ \hline \end{array}$ b. $\begin{array}{r} 5 \\ 7 \\ +\ 8 \\ \hline \end{array}$ c. $\begin{array}{r} 12 \\ 17 \\ +\ 99 \\ \hline \end{array}$ d. $\begin{array}{r} 142 \\ 759 \\ +\ 896 \\ \hline \end{array}$ e. $\begin{array}{r} 2345 \\ 9764 \\ +\ 8976 \\ \hline \end{array}$

5. Subtract whole numbers to solve the following problems. Check your answers and show your work.

a. $\begin{array}{r} 9 \\ -\ 7 \\ \hline \end{array}$ b. $\begin{array}{r} 35 \\ -\ 9 \\ \hline \end{array}$ c. $\begin{array}{r} 481 \\ -\ 79 \\ \hline \end{array}$ d. $\begin{array}{r} 684 \\ -\ 342 \\ \hline \end{array}$ e. $\begin{array}{r} 9867 \\ -\ 8748 \\ \hline \end{array}$

6. Multiply whole numbers to solve the following problems. Show your work.

a. $\begin{array}{r} 7 \\ \times\ 5 \\ \hline \end{array}$ b. $\begin{array}{r} 68 \\ \times\ 9 \\ \hline \end{array}$ c. $\begin{array}{r} 735 \\ \times\ 68 \\ \hline \end{array}$ d. $\begin{array}{r} 649 \\ \times\ 537 \\ \hline \end{array}$ e. $\begin{array}{r} 8673 \\ \times\ 642 \\ \hline \end{array}$

7. Divide whole numbers to solve the following problems. Show your work.

a. $4\overline{)48}$ b. $16\overline{)64}$ c. $38\overline{)608}$

d. $421\overline{)842}$ e. $317\overline{)4569}$ f. $530\overline{)80960}$

Written Test

8. Distinguish among types of fractions. Write a "P" in the blanks before proper fractions, an "I" before improper fractions, and an "M" in the blanks before mixed numbers.

______a. 1/2

______b. 8 3/4

______c. 8/8

______d. 15 3/8

______e. 5 3/16

______f. 10/32

______g. 2/8

______h. 6 1/2

______i. 1/4

______j. 99/1

9. Reduce the following fractions to lowest terms. Write your answers in the blanks.

______a. 4/8

______b. 8/16

______c. 7/16

______d. 8/32

______e. 12/32

______f. 4/16

______g. 2/16

______h. 8/64

______i. 12/16

______j. 31/32

10. Convert the following fractions and mixed numbers.

a. Convert to improper fractions. Reduce to lowest terms if possible. Write your answers in the blanks.

______(1) $3\frac{1}{2}$

______(2) $4\frac{2}{4}$

______(3) $3\frac{6}{8}$

______(4) $12\frac{4}{8}$

______(5) $13\frac{13}{32}$

Written Test

b. Convert to mixed numbers. Reduce answers to lowest terms. Write your answers in the blanks.

______(1) $\frac{47}{8}$

______(2) $\frac{21}{9}$

______(3) $\frac{108}{23}$

______(4) $\frac{54}{5}$

______(5) $\frac{112}{7}$

11. Add fractions to solve the following problems. Convert to mixed numbers if necessary, and reduce to lowest terms. Write your answers in the blanks.

______a. $\frac{1}{8} + \frac{5}{8}$

______b. $\frac{1}{16} + \frac{15}{16}$

______c. $\frac{2}{4} + \frac{3}{4}$

______d. $\frac{1}{2} + \frac{4}{8}$

______e. $\frac{4}{8} + \frac{2}{4}$

______f. $\frac{7}{8} + \frac{6}{16}$

______g. $2\frac{1}{8} + 7\frac{1}{4}$

______h. $3\frac{2}{4} + 16\frac{1}{8}$

______i. $4\frac{2}{4} + 8\frac{2}{8}$

______j. $5\frac{1}{8} + 6\frac{2}{16}$

Written Test

12. Subtract fractions to solve the following problems. Reduce answers to lowest terms. Write your answers in the blanks.

______a. $\frac{4}{8} - \frac{3}{8}$

______b. $\frac{6}{8} - \frac{2}{8}$

______c. $\frac{9}{16} - \frac{4}{16}$

______d. $\frac{3}{8} - \frac{1}{4}$

______e. $\frac{3}{8} - \frac{1}{8}$

______f. $\frac{14}{16} - \frac{7}{8}$

______g. $2\frac{3}{4} - 1\frac{1}{4}$

______h. $6\frac{1}{8} - 2\frac{1}{2}$

______i. $9\frac{2}{4} - 4\frac{1}{2}$

______j. $12\frac{6}{8} - \frac{71}{8}$

13. Multiply fractions to solve the following problems. Reduce to lowest terms. Write your answers in the blanks.

______a. $\frac{1}{2} \times \frac{3}{4}$

______b. $\frac{3}{4} \times \frac{3}{8}$

______c. $\frac{3}{2} \times \frac{1}{16}$

______d. $\frac{3}{4} \times 6\frac{1}{2}$

______e. $6\frac{3}{4} \times 8\frac{3}{4}$

______f. $7\frac{1}{8} \times 1\frac{1}{2}$

______g. $\frac{77}{16} \times 5$

Written Test

14. Label the place values in the decimal number below.

0. 0 8 7 1 6 4

f. ______________________

e. ______________________

d. ______________________

c. ______________________

b. ______________________

a. ______________________

15. Add decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

______a. 3.5 + 5.1 + 7

______b. 3.4 + 0.206 + 1.74

______c. $6.86 + $5.05 + $7.90 + $.82

______d. 57.78 + 0.22 + 0.003 + 74

______e. 6319 + 95.12 + 0.0713 + 321.07

Written Test

16. Subtract decimal numbers to solve the following problems. Set up each problem and check your work. Write your answers in the blanks.

_____ a. $6.10 – $2.20

_____ b. $5.40 – $2.32

_____ c. $7.38 – $.63

_____ d. 0.835325 – 0.25

_____ e. 0.609375 – 0.359375

17. Multiply decimal numbers to solve the following problems. Set up each problem and show your work. Write your answers in the blanks.

_____ a. 2.6 × 4.7

_____ b. 0.119 × 0.05

_____ c. 9 × 0.08

_____ d. 7.392 × 92.07

_____ e. 9.5 × 0.76

Written Test

18. Divide decimals to solve the following problems. Set up each problem and check your work. Write your answers in the blanks.

______a. 5.32 ÷ 0.4

______b. 83.4 ÷ 0.6

______c. 7.75 ÷ 0.25

______d. 0.921 ÷ 0.3

______e. 0.0225 ÷ 0.15

______f. 24 ÷ 0.2

______g. 54 ÷ 0.09

______h. 63 ÷ 0.007

______i. 812 ÷ 0.058

______j. 4125 ÷ 0.040

Written Test

19. Discuss the two methods of expressing fractions and decimal equivalents.

20. List the three purposes of a decimal equivalent chart.

a. ____________________

b. ____________________

c. ____________________

21. Use a decimal equivalent chart

Fractions to decimals

a. 1/8 = ____________

b. 25/32 = ____________

c. 3/8 = ____________

d. 15/16 = ____________

e. 1/2 = ____________

Decimals to fractions

f. .21875 = ____________

g. .5625 = ____________

h. .750 = ____________

i. .875 = ____________

j. .078125 = ____________

Written Test

Decimal Equivalent Chart

1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.1250	5/8	.6250
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.671875
3/16	.1875	11/16	.6875
13/64	.203125	45/64	.703125
7/32	.21875	21/32	.71875
15/64	.234375	47/64	.734375
1/4	.2500	3/4	.7500
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	.3125	13/16	.8125
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	.3750	7/8	.8750
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	.4375	15/16	.9375
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	.5000	1	.1000

Written Test

22. a. Convert the following decimal fractions to common fractions. Write your answers in the blanks.

______(1) .6

______(2) .55

______(3) .09

______(4) .650

______(5) .925

b. Convert the following percentages to fractions and decimal numbers. Write your answers in the blanks.

Fraction	Decimal	
____________	____________	(1) 12%
____________	____________	(2) 30%
____________	____________	(3) 45%
____________	____________	(4) 72%
____________	____________	(5) 250%

23. Solve the following percentage problems. Write your answers in the blanks.

______a. If a parts manager paid a counterperson $150.00, which is 87 percent of the base salary, how much more money would the counterperson have coming?

______b. If 75 percent of the 24 items for a customer are in stock, how many items will have to be ordered for the customer?

______c. If a parts dealer bought $24,000 worth of parts and sold them for $30,000, what was the percentage of profit?

Written Test

24. Compute the following discounts and sale prices. Show all work.

    a. A set of tires regularly selling for $200 on sale for $150 is discounted what percent?

       Percent of discount ____________

    b. A set of socket wrenches regularly priced at $69.95 on sale for $48.95 is discounted what percent?

       Percent of discount ____________

    c. A car stereo regularly selling for $279.00 on sale for $237.15 is discounted what percent?

       Percent of discount ____________

    d. What is the sale price for a $19.95 chamois discounted 10 percent? (Round to nearest dollar.)

       Sale price ____________

    e. What is the sale price for a can of $6 car wax discounted 20 percent?

       Sale price ____________

Written Test

25. Match metric prefixes with their values. Write the correct numbers in the blanks.

______a. 100		1. kilo- (k)
______b. 1/1000		2. deka- (da)
______c. 1/100		3. hecto- (h)
______d. 1/10		4. centi- (c)
______e. 10		5. milli- (m)
______f. 1,000		6. deci- (d)

26. Use an English-Metric conversion chart.

	When You Know	You Can Convert To	When You Multiply By
Weight (Mass)	Ounces Grams Pounds Kilograms	Grams Ounces Kilograms Pounds	28.4 0.035 0.45 2.2
Velocity	Miles/hour Kilometers/hour	Kilometer/hour Miles/hour	1.609 0.621

a. Marcus is driving 60 miles per hour. How many kilometers per hour is he driving?

b. Leah has a box to ship weighing 20 pounds. How many kilograms does the box weigh?

*Permission to duplicate this test is granted.

Applied Math for Parts Specialists
Unit 5

Unit Evaluation Form

Student Name ______________________ Unit Rating __________

Assignment Sheet 1—Add Whole Numbers Rating ______

Comments: ______________________

____

Assignment Sheet 2—Subtract Whole Numbers Rating ______

Comments: ______________________

____

Assignment Sheet 3—Multiply Whole Numbers Rating ______

Comments: ______________________

____

Assignment Sheet 4—Divide Whole Numbers Rating ______

Comments: ______________________

____

Assignment Sheet 5—Reduce Fractions to Lowest Terms Rating ______

Comments: ______________________

____

Assignment Sheet 6—Convert Fractions and Mixed Numbers Rating ______

Comments: ______________________

____

Unit Evaluation Form

Assignment Sheet 7—Add Fractions Rating ______

Comments: ____

____

Assignment Sheet 8—Subtract Fractions Rating ______

Comments: ____

____

Assignment Sheet 9—Multiply Fractions Rating ______

Comments: ____

____

Assignment Sheet 10—Add Decimal Numbers Rating ______

Comments: ____

____

Assignment Sheet 11—Subtract Decimal Numbers Rating ______

Comments: ____

____

Assignment Sheet 12—Multiply Decimal Numbers Rating ______

Comments: ____

____

Assignment Sheet 13—Divide Decimal Numbers Rating ______

Comments: ____

____

Unit Evaluation Form

Assignment Sheet 14—Use a Decimal Equivalent Chart Rating ______

Comments: ______

______

Assignment Sheet 15—Convert Fractions and Percentages Rating ______

Comments: ______

______

Assignment Sheet 16—Solve Percentage Problems Rating ______

Comments: ______

______

Assignment Sheet 17—Compute Discounts and Sale Prices Rating ______

Comments: ______

______

Assignment Sheet 18—Use an English-Metric Conversion Chart Rating ______

Comments: ______

______

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ______

______

Teacher Signature ______ Date ______

Student Signature ______ Date ______

***Permission to duplicate this form is granted.**

Decimal Equivalent Chart

	1/64	.015625	
	1/32	.03125	
	3/64	.046875	
1/16			.0625
	5/64	.078125	
	3/32	.09375	
	7/64	.109375	
1/8			.1250
	9/64	.140625	
	5/32	.15625	
	11/64	.171875	
3/16			.1875
	13/64	.203125	
	7/32	.21875	
	15/64	.234375	
1/4			.2500
	17/64	.265625	
	9/32	.28125	
	19/64	.296875	
5/16			.3125
	21/64	.328125	
	11/32	.34375	
	23/64	.359375	
3/8			.3750
	25/64	.390625	
	13/32	.40625	
	27/64	.421875	
7/16			.4375
	29/64	.453125	
	15/32	.46875	
	31/64	.484375	
1/2			.5000
	33/64	.515625	
	17/32	.53125	
	35/64	.546875	
9/16			.5625
	37/64	.578125	
	19/32	.59375	
	39/64	.609375	
5/8			.6250
	41/64	.640625	
	21/32	.65625	
	43/64	.671875	
11/16			.6875
	45/64	.703125	
	21/32	.71875	
	47/64	.734375	
3/4			.7500
	49/64	.765625	
	25/32	.78125	
	51/64	.796875	
13/16			.8125
	53/64	.828125	
	27/32	.84375	
	55/64	.859375	
7/8			.8750
	57/64	.890625	
	29/32	.90625	
	59/64	.921875	
15/16			.9375
	61/64	.953125	
	31/32	.96875	
	63/64	.984375	
1			.1000

Fractional and Decimal Equivalents

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Teacher Page 39

0 . 0 0 0 0

Fraction		Decimal		Word
1/4	=	0.250	=	Two hundred fifty thousandths.
1/2	=	0.500	=	Five hundred thousandths.
7/8	=	0.875	=	Eight hundred seventy-five thousandths.
7/16	=	0.4375	=	Four hundred thirty-seven thousandths and five ten-thousandths.

TM 2

English-Metric Conversion Chart

	When You Know	You Can Convert To	When You Multiply By
Length	Inches	Millimeters (mm)	25.4
	Millimeters	Inches	0.04
	Inches	Centimeters (cm)	2.54
	Centimeters	Inches	0.4
	Inches	Meters (m)	0.0254
	Meters	Inches	39.37
	Feet	Centimeters	30.5
	Centimeters	Feet	4.8
	Feet	Meters	0.305
	Meters	Feet	3.28
	Miles	Kilometers (km)	1.61
	Kilometer	Miles	0.62
Area	Inches^2	Millimeters^2 (mm^2)	645.2
	Millimeters^2	Inches^2	0.0016
	Inches^2	Centimeters^2 (cm^2)	6.45
	Centimeters^2	Inches^2	0.16
	Foot^2	Meters^2 (m^2)	0.093
	Meters^2	Foot^2	10.76
Capacity-Volume	Ounces	Milliliters (ml)	30
	Milliliters	Ounces	0.034
	Pints	Liters (l)	0.47
	Liters	Pints	2.1
	Quarts	Liters	0.95
	Liters	Quarts	1.06
	Gallons	Liters	3.8
	Liters	Gallons	0.26
	Cubic Inches	Liters	0.0164
	Liters	Cubic Inches	61.03
	Cubic Inches	Cubic Centimeters (cc)	16.39
	Cubic Centimeters	Cubic Inches	0.061
Weight (Mass)	Ounces	Grams	28.4
	Grams	Ounces	0.035
	Pounds	Kilograms	0.45
	Kilograms	Pounds	2.2
Force	Ounce	Newtons (N)	0.278
	Newtons	Ounces	35.98
	Pound	Newtons	4.448
	Newtons	Pound	0.225
	Newtons	Kilograms (KG)	0.102
	Kilograms	Newtons	9.807

English-Metric Conversion Chart
(Continued)

	When You Know	You Can Convert	When You Multiply By
Acceleration	Inch/Sec^2	Meter/Sec^2	.0254
	Meter/Sec^2	Inch/Sec^2	39.37
	Foot/Sec^2	Meter/Sec^2 (m/s^2)	0.3048
	Meter/Sec^2	Foot/Sec^2	3.280
Torque	Pound-Inch (Inch Pound)	Newton-Meters (N-M)	0.113
	Newton-Meters	Pound-Inch	8.857
	Pound-Foot (Foot-Pound)	Newton-Meters	1.356
	Newton-Meters	Pound-Foot	.737
Pressure	Pound/sq. in. (PSI)	Kilopascals (kPa)	6.895
	Kilopascals	Pound/sq. in.	0.145
	Inches of Mercury (Hg)	Kilopascals	3.377
	Kilopascals	Inches of Mercury (Hg)	0.296
Fuel Performance	Miles/gal	Kilometers/liters (km/l)	0.425
	Kilometers/liters	Miles/gal	2.352
Velocity	Miles/hour	Kilometers/hr (km/h)	1.609
	Kilometers/hour	Miles/hour	0.621
Temperature	Degrees Fahrenheit	Degrees Celsius	5/9 (F°−32)
	Degrees Celsius	Degrees Fahrenheit	9/5 (C°+32)=F

Applied Math for Parts Specialists
Unit 5

Information Sheet

1. **Terms and definitions associated with math and measuring**

   a. **Addition** — Process of totaling two or more numbers to find another number called a sum

   Example: $3 + 5 + 9 = 17$

   b. **Decimal** — Fraction with an unwritten denominator of 10 or some power of 10; indicated with a point before the number

   Examples: $0.1 = 1/10$ $0.06 = 6/100$ $0.003 = 3/1000$

   c. **Denominator** — Base or lower number of a fraction

   Example: The denominator of 3/4 is 4.

   d. **Digit** — Any one of the ten symbols, 0 to 9, by which all numbers can be expressed

   e. **Division** — Opposite operation of multiplication

   Example: $16 \div 2 = 8$ as opposed to $8 \times 2 = 16$

   f. **Fraction** — Part of a whole; represents one or more equal parts of a unit (Figures 1 and 2)

   Examples:

Figure 1

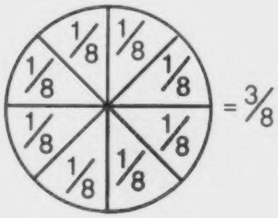
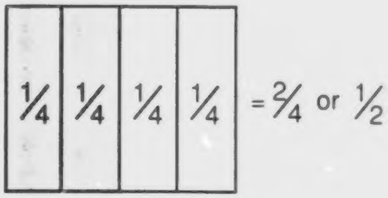


Figure 2



   g. **Liter** — Metric unit used to measure capacity or volume

   h. **Meter** — Metric unit used to measure length

Information Sheet

i. **Multiplication** — Abbreviated process of adding a number to itself a specified number of times

Example: $6 \times 3 = 18$ as opposed to $6 + 6 + 6 = 18$

j. **Numerator** — Top number of a fraction

Example: The numerator of 1/3 is 1.

k. **Percent** — One part in a hundred; reckoned on the basis of a whole divided into one hundred parts

l. **Proportional** — Being relatively equal in size or quantity

Example: 1:1:3 = 0.5:0.5:1.5

m. **Ratio** — Relationship in quantity, amount, or size between two or more things

n. **Subtraction** — Opposite operation of addition

Example: $8 - 4 = 4$ as opposed to $4 + 4 = 8$

o. **Whole number (integer)** — Any of the natural numbers, both positive and negative, that represents a complete item

Example: 25 is a whole number as opposed to ¾, a fraction or part of a whole.

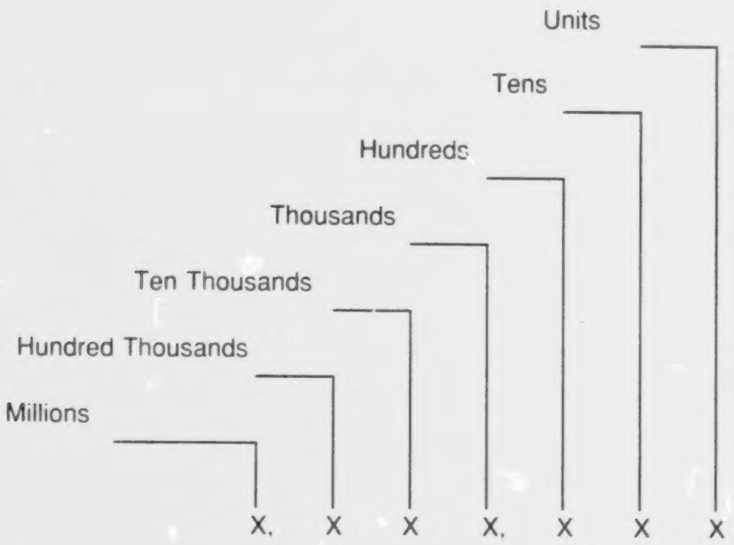
2. Symbols used in math problems

a.	Plus sign (addition)	+
b.	Minus sign (subtraction)	−
c.	Times sign (multiplication)	×
d.	Division sign	÷
e.	Division frame	$\overline{)\quad}$
f.	Equal sign	=
g.	Decimal point	.
h.	Percent symbol	%
i.	Ratio symbol	:
j.	Pi sign	π

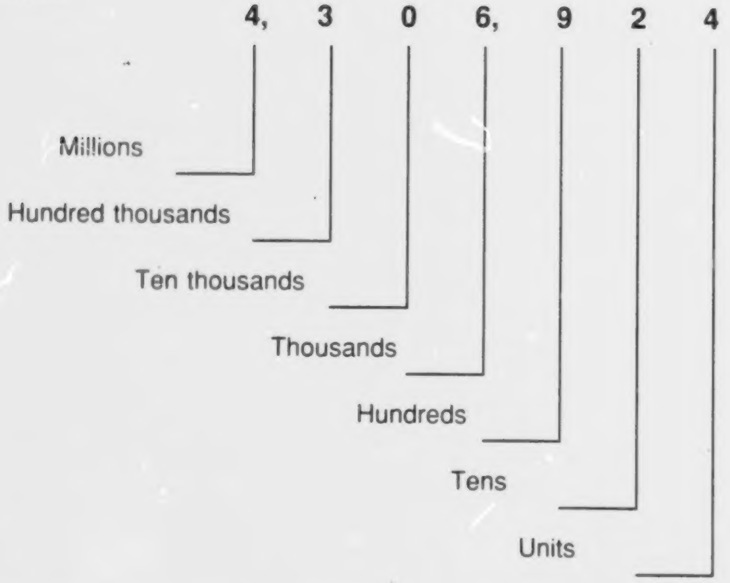
Information Sheet

3. Place values of a whole number

Note: The position of a digit in a number shows how much that digit is worth. These positions are called *place values*.


Units
Tens
Hundreds
Thousands
Ten Thousands
Hundred Thousands
Millions
X, X X X, X X X

Example:


4, 3 0 6, 9 2 4
Millions
Hundred thousands
Ten thousands
Thousands
Hundreds
Tens
Units

Note: The number in this example is four million, three hundred six thousand, nine hundred twenty-four.

Information Sheet

4. Adding whole numbers

a. Set up problem by writing units under units, tens under tens, and so on.

Example: Add the whole numbers 1632, 17, 550.

$$\begin{array}{r} 1632 \\ 17 \\ \underline{+\ \ 550} \end{array}$$

b. Add each column separately, beginning at top of units column.

Example:

$$\begin{array}{r} 1632 \\ 17 \\ \underline{+\ \ 550} \\ 9 \end{array} \qquad \begin{array}{r} 1632 \\ 17 \\ \underline{+\ \ 550} \\ 99 \end{array}$$

c. If the sum of any column is two or more digits, write the units digit in your answer and carry the remaining digit(s) to the top of next column to the left.

Example:

$$\begin{array}{rr} & \\ & 1632 \\ & 17 \\ \text{Write units} & \underline{+\ \ 550} \\ \text{digit.} & \rightarrow 199 \end{array} \qquad \begin{array}{rl} \mathbf{1} \leftarrow & \text{Carry remaining} \\ 1632 & \quad \text{digit.} \\ 17 & \\ \underline{+\ \ 550} & \\ 199 & \end{array}$$

d. Add any carried digit(s) above the column with that column.

Example:

$$\begin{array}{rl} \mathbf{1}\ \ \ \ & \text{Carried Digit} \\ 1632 & \\ 17 & \\ \underline{+\ \ 550} & \\ 2199 & \end{array}$$

5. Subtracting whole numbers

a. Set up problem by writing units under units, tens under tens, and so on.

Note: The top number in the problem (original number) is almost always larger than the bottom number (subtracted number).

Example: Subtract 91 from 123.

$$\begin{array}{rl} 123 & \quad \text{Original Number} \\ \underline{-\ \ \ 91} & \quad \text{Subtracted Number} \end{array}$$

Information Sheet

b. Subtract each column separately, beginning at bottom of units column.

Example:
$$\begin{array}{r} 123 \\ \underline{-\ \ 91}\uparrow \\ 2 \end{array}$$

c. If a digit in the subtracted number is larger than the digit above it, "borrow" 1 from the top digit in the next column to the left, decreasing that digit by one and increasing the digit being subtracted by ten.

Example:
$$\begin{array}{r} 123 \\ \underline{-\ \ 91} \\ 32 \end{array}$$

d. If there is nothing to borrow in the next left column (column contains a zero), first borrow for that column from its next left column.

Example:
$$\begin{array}{rrrr} 906 & 906 & 906 & 906 \\ \underline{-\ 318} & \underline{-\ 318} & \underline{-\ 318} & \underline{-\ 318} \\ & 8 & 88 & 588 \end{array}$$

e. Check your subtraction by adding your answer to the subtracted number.

Example:

	Problem		Check
271	Original Number	271	Original Number
$\underline{-\ 164}\uparrow$	Subtracted Number	$\underline{-\ 164}$	
107	Answer	$\underline{+\ 107}$	
		271	Check Answer

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

6. Multiplying whole numbers

a. Set up problem by writing the larger number (original number) above the smaller number (multiplier), writing units under units, tens under tens, and so on.

Note: You will get the correct answer (product) no matter which number is placed above the other, but the faster method places the larger above the smaller.

Example: Multiply the numbers 53 and 4.

$$\begin{array}{rl} 53 & \text{Orignial Number} \\ \underline{\times\ \ 4} & \text{Multiplier} \end{array}$$

Information Sheet

b. If the multiplier contains only one digit, multiply each digit in the original number by it, working from right to left.

- Multiply units digit in original number by multiplier.
- Write answer units digit and insert necessary carry digit above next left column in original number as required.

Example:

$$\begin{array}{r} \mathbf{1} \\ 53 \\ \uparrow \\ \times\ \ 4 \\ \hline 2 \end{array}$$

- Multiply tens digit by multiplier and add carried digit as required.

Example:

$$\begin{array}{r} \mathbf{1} \\ 53 \\ \nwarrow \\ \times\ \ 4 \\ \hline 2 \end{array}$$

c. If the multiplier contains more than one digit, find partial products.

- Multiply each digit in original number by each digit in multiplier, moving from right to left.
- Align partial products so that right-hand digit of each is directly under its corresponding digit in the multiplier.

Example: Multiply the numbers 174 and 42

$$\begin{array}{r} \\ 174 \\ \uparrow \\ \times\ 42 \\ \hline 8 \end{array} \qquad \begin{array}{r} \mathbf{1} \\ 174 \\ \nwarrow \\ \times\ 42 \\ \hline 48 \end{array} \qquad \begin{array}{r} \\ 174 \\ \nwarrow \\ \times\ 42 \\ \hline 348 \\ \uparrow \\ \text{First Partial} \\ \text{Product} \end{array} \qquad \begin{array}{r} \mathbf{1} \\ 174 \\ \nearrow \\ \times\ 42 \\ \hline 348 \\ 6 \end{array} \qquad \begin{array}{r} \mathbf{1} \\ 174 \\ \uparrow \\ \times\ 42 \\ \hline 348 \\ 96 \end{array} \qquad \begin{array}{r} \mathbf{2} \\ 174 \\ \nwarrow \\ \times\ 42 \\ \hline 348 \\ 696 \\ \uparrow \\ \text{Second Partial} \\ \text{Product} \end{array}$$

Information Sheet

d. Add the partial products.

Example:

$$\begin{array}{r} 174 \\ \underline{\times \quad 42} \\ 348 \\ \underline{+\ 696\ \ } \\ 7308 \end{array} \quad \text{Answer (Product)}$$

7. Dividing whole numbers

a. Set up problem by writing original number (number to be divided) inside a division frame, and by writing divisor (number you are dividing by) outside frame.

Example: How many times will 33 go into 3347?

Divisor $33\overline{)3347}$ Original Number

b. Determine how many times the divisor will go into the first digit of the original number. If it will not, write a zero in the answer space directly above the first digit. Then determine how many times the divisor will go into the first two numbers of the original number.

Note: Continue trying to divide the original number by the divisor until a set of digits can be divided. Remember to write a zero each time the set of digits cannot be divided.

Example:

$$\begin{array}{r} 0 \\ 34\overline{)3347} \end{array} \quad \text{34 goes into 3 zero times.}$$

$$\begin{array}{r} 00 \\ 34\overline{)3347} \end{array} \quad \text{34 goes into 33 zero times.}$$

$$\begin{array}{r} 009 \\ 34\overline{)3347} \end{array} \quad \text{34 goes into 334 nine times.}$$

Information Sheet

c. Multiply the divisor by the answer (digit above frame); write this answer under the digit(s) that divisor went into, and subtract.

Example:
$$\begin{array}{r} 34 \\ \times\ \underline{\ \ 9} \\ 306 \end{array}$$
Multiply divisor (34) by answer (9).

$$\begin{array}{r} 009 \\ 34\overline{)3347} \\ -\underline{306} \\ 28 \end{array}$$
Write answer under 334, the digits divisor went into, and subtract.

d. Bring down next unused digit from original number, and place it to the right of the subtracted difference (remainder)—even if the remainder is zero.

Example:
$$\begin{array}{r} 009 \\ 34\overline{)3347} \\ \underline{306\downarrow} \\ 287 \end{array}$$

e. Determine how many times the divisor will go into this new number; write your answer in the answer space above the digit that was brought down.

Example:
$$\begin{array}{r} 0098 \\ 34\overline{)3347} \\ \underline{306} \\ 287 \end{array}$$

f. Multiply the divisor by the last digit you wrote in the answer; write this product under the digits that divisor went into, and subtract.

Example:
$$\begin{array}{r} 34 \\ \times\ \underline{\ \ 8} \\ 272 \end{array}$$
Multiply divisor (34) by answer (8).

$$\begin{array}{r} 0098 \\ 34\overline{)3347} \\ \underline{306} \\ 287 \\ -\ \underline{272} \\ 15 \end{array}$$
Write product under 287, the digits that divisor went into, and subtract.

g. Continue this process until all numbers in the original number are used.

Information Sheet

h. Write any remaining subtracted difference as a remainder.

Example:

$$\begin{array}{rl} 0098 & \\ 34\overline{)3347} & \\ \underline{306} & \\ 287 & \\ \underline{272} & \\ 15 & \text{Remainder} \end{array}$$

i. Check your answer by multiplying your answer times the divisor and adding the remainder to this number.

Note: If you have solved the problem correctly, your check answer should be the same as your original number.

Example:

$$\begin{array}{rl} 98 & \text{Answer} \\ \underline{\times\ 34} & \text{Divisor} \\ 392 & \\ \underline{294} & \\ 3332 & \\ \underline{+\ \ 15} & \text{Remainder} \\ 3347 & \text{Check Answer (Same as Original Number)} \end{array}$$

8. **Distinguishing among types of fractions**

a. **Proper** — Top number of fraction (numerator) is smaller than bottom number of fraction (denominator).

Example: $\frac{7}{8}$ Numerator / Denominator

b. **Improper** — Top number of fraction (numerator) is larger than bottom number of fraction (denominator).

Examples: $\frac{9}{8}$ $\frac{16}{16}$

c. **Mixed numbers** — Contain a whole number and a proper fraction.

Examples: 9 1/2, 1 7/8, 4 3/4

Information Sheet

9. **Reducing fractions to lowest terms**—Divide the numerator and denominator by the largest whole number that will go into each evenly.

Example: Reduce 4/16 to its lowest terms.

$$\frac{4}{16} = \frac{4 \div 4}{16 \div 4} = \frac{1}{4}$$

Note: The fraction 1/4 is reduced to its lowest term because the numerator (1) and the denominator (4) cannot be divided by the same number.

10. **Converting mixed numbers and improper fractions**

a. Converting mixed numbers to improper fractions

- Multiply the whole number by the denominator of the fraction.

  Example: Convert 4 3/8 to an improper fraction.

  $8 \times 4 = 32$

- Add your answer to the numerator.

  Example: $32 + 3 = 35$

- Place this sum over the original denominator.

  Example: $\frac{35}{8}$ Improper Fraction

b. Converting improper fractions to mixed numbers

- Divide the numerator by the denominator.

  Example: Convert 18/15 to a mixed number.

  $$\begin{array}{r} 01 \\ 15\overline{)18} \\ \underline{15} \\ 3 \end{array} \quad \text{Remainder}$$

- Place the remainder over the denominator.

  Example: $\frac{3}{15}$ $\begin{array}{l}\text{Remainder} \\ \text{Denominator}\end{array}$

Information Sheet

- Reduce this fraction if necessary.

  Example: $\frac{3}{15} = \frac{3 \div 3}{15 \div 3} = \frac{1}{5}$

- Add the reduced fraction to the whole number obtained by dividing the numerator by the denominator.

  Example: $1 + \frac{1}{5} = 1\frac{1}{5}$ Mixed Number

11. Adding fractions

a. Like fractions

Note: Like fractions are those having the same, or common, denominators.

Examples: 1/4 and 2/4, 5/8 and 5/8, and 1/16 and 3/16

- Add the numerators.
- Place sum of numerators over common denominator.
- Convert to mixed numbers and reduce as required.

Example 1: Add 1/4 and 2/4.

$$\frac{1}{4} + \frac{2}{4} = \frac{1 + 2}{4} = \frac{3}{4}$$

Example 2: Add 5/8 and 5/8.

$$\frac{5}{8} + \frac{5}{8} = \frac{5 + 5}{8} = \frac{10}{8} = 10 \div 8 = 1\frac{2}{8} = 1\frac{1}{4}$$

Example 3: Add 1/16 and 3/16.

$$\frac{1}{16} + \frac{3}{16} = \frac{1 + 3}{16} = \frac{4}{16} = \frac{4 + 4}{16 \div 4} = \frac{1}{4}$$

Information Sheet

b. Unlike fractions

Examples: 11/12 and 3/9, 1/8 and 3/4

- Change to like fractions.
  - Find the lowest number into which each denominator can be divided evenly (lowest common denominator).
  - Multiply the numerators and denominators of each fraction by the number of times its denominator can be divided into the lowest common denominator.

Example 1: Add 11/12 and 3/9.

36 is lowest number into which both 12 and 9 can be divided evenly.

36 ÷ 12 = 3

36 ÷ 9 = 4

$$\frac{11}{12} = \frac{11 \times 3}{12 \times 3} = \frac{33}{36}$$

$$\frac{3}{9} = \frac{3 \times 4}{9 \times 4} = \frac{12}{36}$$

Example 2: Add 1/8 and 3/4.

8 is the lowest number into which both 8 and 4 can be divided evenly.

8 ÷ 8 = 1

8 ÷ 4 = 2

1/8 remains as 1/8 because 8 is the common denominator.

$$\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$$

Information Sheet

- Add like fractions and reduce or convert to mixed numbers as required.

Example 1: Add 11/12 and 3.9.

$$\frac{11}{12} = \frac{33}{36} \text{ and } \frac{3}{9} = \frac{12}{36}$$

$$\frac{33}{36} + \frac{12}{36} = \frac{33 + 12}{36} = \frac{45}{36} = \frac{5}{4} = 1\frac{1}{4}$$

Example 2: Add 1/8 and 3/4.

$$\frac{1}{8} \text{ remains } \frac{1}{8} \text{ and } \frac{3}{4} = \frac{6}{8}$$

$$\frac{1}{8} + \frac{6}{8} = \frac{1 + 6}{8} = \frac{7}{8}$$

c. Mixed numbers

- Add whole numbers.
- Add fractions, first finding common denominators if necessary, and reduce or convert to mixed numbers as necessary.
- Add the sums of steps 1 and 2.

Example 1: Add 3 1/8 and 7 3/8.

Add whole numbers: $3 + 7 = 10$

Add fractions and reduce: $\frac{1}{8} + \frac{3}{8} = \frac{1 + 3}{8} = \frac{4}{8} = \frac{1}{2}$

Add the sums of steps 1 and 2: $10 + \frac{1}{2} = 10\frac{1}{2}$

Information Sheet

Example 2: Add 4 2/3 and 1 5/6.

Add whole numbers: 4 + 1 = 5

Find common denominator: $\frac{2}{3} + \frac{5}{6} = \frac{4}{6} + \frac{5}{6}$

Add fractions, convert to mixed number, and reduce: $\frac{4}{6} + \frac{5}{6} = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$

Add sums of steps 1 and 2: $5 + 1\frac{1}{2} = 6\frac{1}{2}$

12. Subtracting fractions

a. Like fractions

- Subtract smaller numerator from larger numerator.

  Example: Subtract 1/16 from 7/16.

  7 − 1 = 6

- Place subtraction answer over common denominator.

  Example: $\frac{6}{16}$

- Reduce to lowest terms as required.

  Example: $\frac{6}{16} = \frac{3}{8}$

b. Unlike fractions

- Change to like fractions.

  Example: Subtract 1/2 from 3/4.

  ¾ remains the same because 4 is the common denominator.

  $\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$

Information Sheet

- Subtract as for like fractions.

  Example: $\frac{3}{4} - \frac{2}{4} = \frac{3-2}{4} = \frac{1}{4}$

- Reduce to lowest terms as required.

c. Mixed numbers

- Convert mixed numbers to like fractions.

  Example: Subtract 3 1/2 from 5 1/8.

  $$5\frac{1}{8} - 3\frac{1}{2} =$$

  $$5\frac{1}{8} - 3\frac{4}{8}$$

- Borrow a one from the original whole number if needed, convert the one to a like fraction, and add it to the smaller fraction.

  Note: This step is needed only if the like fraction in the original number is smaller than the like fraction in the subtracted number.

  Example:

  $$\begin{aligned} 5\frac{1}{8} - 3\frac{4}{8} &= (4\frac{8}{8} + \frac{1}{8}) - 3\frac{4}{8} \\ &= 4\frac{9}{8} - 3\frac{4}{8} \end{aligned}$$

- Subtract whole number from whole number and like fraction from like fraction.

  Example: $4\frac{9}{8} - 3\frac{4}{8} = 1\frac{5}{8}$

13. Multiplying fractions

a. Convert mixed numbers to improper fractions if necessary.

b. Multiply numerators by numerators and denominators by denominators.

c. Write the product of the numerators over the product of the denominators.

d. Convert improper fractions to mixed numbers and reduce as required.

Information Sheet

Example 1: Multiply 1/2 by 3/4.

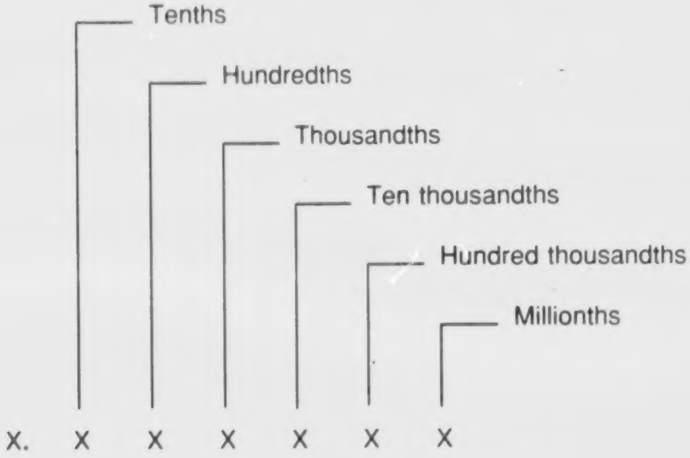
$$\frac{1}{2} \times \frac{3}{4} = \frac{1 \times 3}{2 \times 4} = \frac{3}{8}$$

Example 2: Multiply 1 1/4 by 1/2.

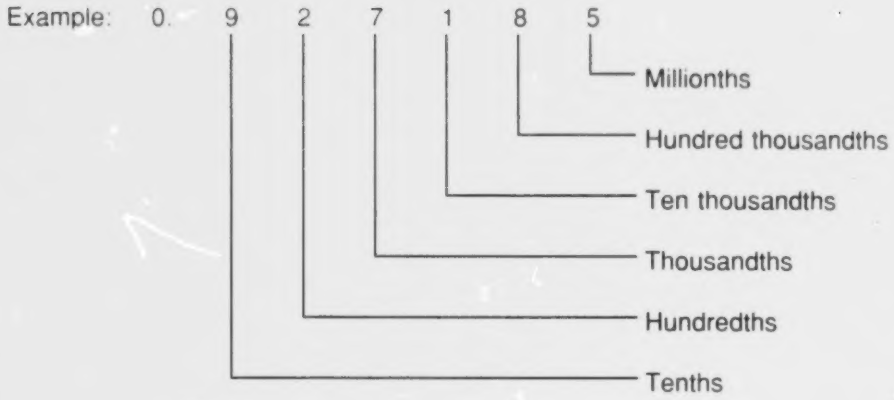
$$1\frac{1}{4} = \frac{5}{4} \quad \text{Convert to improper fraction.}$$

$$\frac{5}{4} \times \frac{1}{2} = \frac{5 \times 1}{4 \times 2} = \frac{5}{8}$$

14. Place values of decimal numbers


Tenths
Hundredths
Thousandths
Ten thousandths
Hundred thousandths
Millionths
X. X X X X X X

Information Sheet


Example: 0. 9 2 7 1 8 5
Millionths
Hundred thousandths
Ten thousandths
Thousandths
Hundredths
Tenths

Note: The number in the example is read as nine hundred twenty-seven thousand, one hundred eighty-five millionths.

15. Adding decimal numbers

a. Set up problem as for addition of whole numbers, aligning decimal points directly under each other.

Note: Zeros may be added to ensure that units line up under units, tens under tens, and so on. Whole numbers have an understood decimal point to the right of the units digit: 7 is 7., 75 is 75., and 754 is 754.

Example: Add 0.857, 2.1, 753, and 370.057.

$$\begin{array}{r} 0.857 \\ 2.1 \\ 753 \\ \underline{+\ 370.057} \end{array} \quad \text{or} \quad \begin{array}{r} 000.857 \\ 002.100 \\ 753.000 \\ \underline{+\ 370.057} \end{array}$$

b. Add each column of numbers as for whole numbers.

c. Locate the decimal point in the answer by placing it directly under the decimal points above.

Example:

$$\begin{array}{rl} 000.857 & \\ 002.100 & \\ 753.000 & \\ \underline{+\ 370.057} & \\ 1126.014 & \text{Answer} \end{array}$$

Information Sheet

16. Subtracting decimal numbers

a. Set up problem as for subtraction of whole numbers, aligning decimal points directly under each other.

Example: Subtract 1.397 from 8.120.

8.120	Original Number
– 1.397	Subtracted Number

b. Subtract each column of numbers as for whole numbers.

c. Locate the decimal point in the answer by placing it directly under the decimal points above.

d. Check your subtraction by adding your answer to the subtracted number.

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

Example:

8.120	Original Number
– 1.397	Subtracted Number
+ 6.723	Answer (Difference)
8.120	Check Answer

17. Multiplying decimal numbers

a. Set up problem and multiply as for multiplication of whole numbers.

Note: Do *not* align the decimal points in columns when setting up multiplication problems for decimal numbers.

Example: Multiply 27.935 by 7.07.

27. 935	Original Number
× 7. 07	Multiplier
195545	
1955450	
19750045	

Information Sheet

b. Add the number of decimal places to the right of the decimal points in the multiplier and original number.

Example:
$$\begin{array}{rrl} 27.935 & 3 & \text{Decimal Places} \\ \underline{\times\ 7.07} & \underline{+2} & \text{Decimal Places} \\ & 5 & \text{Total Decimal Places} \end{array}$$

c. Locate decimal point in answer by beginning at far right digit and counting off as many places to the left as the total decimal places found in step B.

Example:
$$\begin{array}{rl} 27.935 & \\ \underline{\times \quad 7.07} & \\ 195545 & \\ \underline{1955450} & \\ 197.50045 & \text{5 Decimal Places} \end{array}$$

18. **Dividing decimal numbers**

a. Set up problem as for division of whole numbers.

Example: Divide 0.25 by 0.005.

Divisor $0.005\overline{)0.25}$ Original Number

b. Move the decimal point in the divisor to the right of the far right digit in the divisor.

Example: $0.005.\overline{)0.25}$

c. Move the decimal point in the original number to the right by the same number of decimal places that you moved the decimal point in the divisor, adding zeros to the original number if necessary.

Example: $0.005.\overline{)0.250.}$

Note: If you are dividing a decimal number into a whole number, remember that whole numbers have an understood decimal point to the right of the units digit.

Example: $0.03\overline{)9}$ becomes $0.03.\overline{)9.00.}$

d. Place a decimal point in the answer space directly above the repositioned decimal point in the original number.

Example: $0.005.\overline{)0.250\overset{\cdot}{.}}$

Information Sheet

e. Divide as for whole numbers.

Example:

```
        50.
0005.)0250.
        025
         00
```

f. Check your division by multiplying the original divisor (before decimal point was moved) by your answer and adding any remainder to this number.

Note: If you have solved the problem correctly, your check answer should be the same as the original number.

Example:

```
  0.005    Divisor
×    50    Answer
  0.250    Check Answer (Same as Original Number)
```

19. Methods of expressing fractions and decimal equivalents

a. **Word** — May be a written or verbal form of expression; i.e., twenty-one sixty-fourths equal three-hundred twenty-eight thousandths and one ten thousandths

b. **Number** — A system using numerators, denominators, whole numbers, mixed numbers, etc., to signify an expression; i.e., 21/64 = 0.3281

Examples:

0.. 0 0 0 0

Fraction		Decimal		Word
1/4	=	0.250	=	Two hundred fifty thousandths.
1/2	=	0.500	=	Five hundred thousandths.
7/8	=	0.875	=	Eight hundred seventy-five thousandths.
7/16	=	0.4375	=	Four hundred thirty-seven thousandths and five ten-thousandths.

Information Sheet

20. Purposes of a decimal equivalent chart

a. Convert fractions to decimals

b. Convert decimals to fractions

c. Establish standard for unit conversion

Decimal Equivalent Chart

1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.1250	5/8	.6250
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.671875
3/16	.1875	11/16	.6875
13/64	.203125	45/64	.703125
7/32	.21875	21/32	.71875
15/64	.234375	47/64	.734375
1/4	.2500	3/4	.7500
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	.3125	13/16	.8125
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	.3750	7/8	.8750
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	.4375	15/16	.9375
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	.5000	1	.1000

Information Sheet

21. How to use a decimal equivalent chart

a. Observe the order of fraction listings from small to large sizes on the decimal equivalent chart.

Note: If using a chart other than the one provided, ask the instructor to explain the chart.

b. Observe the order of decimal listings from small to large sizes.

c. Locate a fractional size and then locate the decimal equivalent directly to the right.

d. Using reverse order in item c, locate the decimal equivalent and read the fractional size directly to the left.

22. Converting fractions

a. Converting decimal fractions to common fractions

- Remove the decimal point.
- Place number over its respective denominator (10's, 100's, 1000's).
- Cancel zeros when possible.
- Reduce to lowest terms.

Example: Convert .25 to a common fraction

$$.25 = 25 = \frac{25}{100} = \frac{1}{4}$$

Information Sheet

Example: Convert .520 to a common fraction

$$.520 = 520 = \frac{520}{1000} = \frac{52}{100} = \frac{13}{25}$$

b. Converting common fractions to decimals and percentages

- Fractions to decimals — Divide the numerator by the denominator.

  Example: Convert 5/8 to a decimal.

  $\frac{5}{8}$ Numerator / Denominator

$$\begin{array}{r} 0.625 \\ 8\overline{)5.000} \\ \underline{4\,8} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

- Fractions to percentages

  Note: Percent means that a number is a fraction of 100.

  — Convert the fractions to decimals by dividing numerator by denominator.

  — Move the decimal point in the answer two places to the right.

  — Place the percent symbol after the number.

  Example: Convert 7/33 to a percentage.

  $\frac{7}{33}$ Numerator / Denominator

$$\begin{array}{r} 0.2121 = 21.21\% \\ 33\overline{)7.0000} \\ \underline{6\,6} \\ 40 \\ \underline{33} \\ 70 \\ \underline{66} \\ 40 \\ \underline{33} \\ 7 \end{array}$$

Information Sheet

c. Converting percentages to fractions and decimal numbers

- Percentages to fractions

  — Drop the percent symbol.

  — Place the number over 100.

  — Reduce to lowest terms if necessary.

  Example: Convert 38% to a fraction.

$$38\% = 38$$

$$= \frac{38}{100}$$

$$= \frac{19}{50}$$

- Percentages to decimals

  — Drop the percent symbol.

  — Move the decimal point two places to left.

  Example: Convert 74% to a decimal.

$$74\% = 74$$

$$= 0.74$$

23. Solving percentage problems

Note: Percentage problems may involve solving for the percent ("16 is what percent of 80?"), the part ("What number is 20% of 80?"), or the whole ("16 is 20% of what number?").

a. Write the unknown as "X."

Note: The unknown may be the percent, the part, or the whole.

Example: 16 is what percent of 80?

16 is X percent of 80.

Information Sheet

b. Write the percent (known or unknown) as a fraction with a denominator of 100.

Example: 16 is $\frac{X}{100}$ percent of 80.

c. Write the part and the whole as a fraction, writing the part as the numerator and the whole as the denominator.

Example: $\frac{16}{80}$ $\frac{\text{Part}}{\text{Whole}}$

d. Set up the equation by writing the two fractions with an equal sign between them.

Example: $\frac{X}{100} = \frac{16}{80}$

e. Solve the equation by multiplying the numerator of each fraction by the denominator of the other.

Note: This process is known as *cross multiplying*.

Example:

$$\frac{X}{100} = \frac{16}{80}$$

$$80X = 1600$$

f. Divide each side of the equation by the multiplier of X.

Example:

$$80X = 1600$$

$$X = 20\%$$

16 is 20% of 80.

24. How to compute discounts and sales prices

a. Find the discount.

- Write the percent over 100.
- Write the amount of discount over the original price.
- Write the two fractions with an equal sign between them.

Information Sheet

- Cross multiply and solve the resulting equation.

  Example: A tire which sells for $50 is on sale at a discount of 10%. How much is being taken off the price?

  10/100 = n/50
  100n = 500
  n = $5

b. Find the sale price.

- Using the discount.
  - Figure the amount of discount.
  - Subtract the discount from the original price.

    Example: In the example for A above, the discount is $5 and the original price is $50.

    $50 – $5 = $45 sale price

- Using the percent.
  - Subtract the percent of discount from 100%.
  - Write this percent over 100.
  - Write the sale price over the original price.
  - Write the two fractions with an equal sign between them.
  - Cross multiply and solve the resulting equations.

    Example: A tire which sells for $50 is on sale at a discount of 10%. What will you have to pay for it?

    Solution:

    $$\begin{array}{r} 100\% \\ \underline{10\%} \\ 90\% \end{array} \qquad \begin{array}{l} 90/100 = n/50 \\ 100n = 4500 \\ n = \$45 \end{array}$$

Information Sheet

25. Values of prefixes associated with metric measurement

Note: The basic units of measurement in the metric system are the meter (length), liter (capacity), and gram (mass or weight). Other units are named by adding the following prefixes to *meter*, *liter*, or *gram*. Since all measurement units in the metric system are powers of 10, metric prefixes make measurements easily understood. A millimeter, for instance, is one thousandth of a meter.

	Prefix	Value
a.	kilo- (k)	one thousand (1000)
b.	hecto- (h)	one hundred (100)
c.	deka- (da)	ten (10)
d.	deci- (d)	one tenth (1/10)
e.	centi- (c)	one hundredth (1/100)
f.	milli- (m)	one thousandth (1/1000)

26. How to use an English-Metric conversion chart

a. Observe the three columns provided on the English-Metric conversion chart.

b. Observe the left column titled "When You Know."

c. Observe the middle column titled "You Can Convert To."

d. Observe the right column titled "When You Multiply By."

e. Locate conversion factor and compute.

Information Sheet

	When You Know	You Can Convert To	When You Multiply By
Length	Inches	Millimeters (mm)	25.4
	Millimeters	Inches	0.04
	Inches	Centimeters (cm)	2.54
	Centimeters	Inches	0.4
	Inches	Meters (m)	0.0254
	Meters	Inches	39.37
	Feet	Centimeters	30.5
	Centimeters	Feet	4.8
	Feet	Meters	0.305
	Meters	Feet	3.28
	Miles	Kilometers (km)	1.61
	Kilometer	Miles	0.62
Area	Inches^2	Millimeters^2 (mm^2)	645.2
	Millimeters^2	Inches^2	0.0016
	Inches^2	Centimeters^2 (cm^2)	6.45
	Centimeters^2	Inches^2	0.16
	Foot^2	Meters^2 (m^2)	0.093
	Meters^2	Foot^2	10.76
Capacity-Volume	Ounces	Milliliters (ml)	30
	Milliliters	Ounces	0.034
	Pints	Liters (l)	0.47
	Liters	Pints	2.1
	Quarts	Liters	0.95
	Liters	Quarts	1.06
	Gallons	Liters	3.8
	Liters	Gallons	0.26
	Cubic Inches	Liters	0.0164
	Liters	Cubic Inches	61.03
	Cubic Inches	Cubic Centimeters (cc)	16.39
	Cubic Centimeters	Cubic Inches	0.061
Weight (Mass)	Ounces	Grams	28.4
	Grams	Ounces	0.035
	Pounds	Kilograms	0.45
	Kilograms	Pounds	2.2
Force	Ounce	Newtons (N)	0.278
	Newtons	Ounces	35.98
	Pound	Newtons	4.448
	Newtons	Pound	0.225
	Newtons	Kilograms (KG)	0.102
	Kilograms	Newtons	9.807
Acceleration	Inch/Sec^2	Meter/Sec^2	.0254
	Meter/Sec^2	Inch/Sec^2	39.37
	Foot/Sec^2	Meter/Sec^2 (m/s^2)	0.3048
	Meter/Sec^2	Foot/Sec^2	3.280
Torque	Pound-Inch (Inch Pound)	Newton-Meters (N-M)	0.113
	Newton-Meters	Pound-Inch	8.857
	Pound-Foot	Newton-Meters	1.356
	Newton-Meters	Pound-Foot	.737
Pressure	Pound/sq. in. (PSI)	Kilopascals (kPa)	6.895
	Kilopascals	Pound/sq. in.	0.145
	Inches of Mercury (Hg)	Kilopascals	3.377
	Kilopascals	Inches of Mercury (Hg)	0.296
Fuel Performance	Miles/gal	Kilometers/liters (km/l)	0.425
	Kilometers/liters	Miles/gal	2.352
Velocity	Miles/hour	Kilometers/hr (km/h)	1.609
	Kilometers/hour	Miles/hour	0.621
Temperature	Degrees Fahrenheit	Degrees Celsius	5/9 (F°−32)
	Degrees Celsius	Degrees Fahrenheit	9/5 (C°+32)=F

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 1—Add Whole Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 18 of the 22 answers correctly	______

Directions: Solve the following addition problems.

Examples:

$$\begin{array}{r} 5 \\ +\ 10 \\ \hline 15 \end{array} \qquad \begin{array}{r} \mathbf{1} \\ 67 \\ +\ 25 \\ \hline 92 \end{array} \leftarrow \text{Carried Digit} \qquad \begin{array}{r} \mathbf{11} \\ 539 \\ 333 \\ +\ 432 \\ \hline 1304 \end{array} \leftarrow \text{Carried Digits}$$

A. Solve each of the following addition problems. Show your work.

$$1.\ \begin{array}{r} 2 \\ +\ 9 \\ \hline \end{array} \qquad 2.\ \begin{array}{r} 8 \\ +\ 8 \\ \hline \end{array} \qquad 3.\ \begin{array}{r} 7 \\ +\ 6 \\ \hline \end{array} \qquad 4.\ \begin{array}{r} 15 \\ +\ 8 \\ \hline \end{array} \qquad 5.\ \begin{array}{r} 81 \\ +\ 27 \\ \hline \end{array}$$

$$6.\ \begin{array}{r} 7 \\ 38 \\ +\ 43 \\ \hline \end{array} \qquad 7.\ \begin{array}{r} 55 \\ 88 \\ +\ 99 \\ \hline \end{array} \qquad 8.\ \begin{array}{r} 341 \\ 428 \\ +\ 769 \\ \hline \end{array} \qquad 9.\ \begin{array}{r} 472 \\ 564 \\ +\ 881 \\ \hline \end{array} \qquad 10.\ \begin{array}{r} 9876 \\ 5432 \\ +\ 1122 \\ \hline \end{array}$$

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. a. The parts specialist has six air filters remaining in stock. Eight of twelve ordered have just been received. How many air filters will the parts specialist have in stock?

Total air filters with partial order ____________

Assignment Sheet 1

b. How many air filters will be in stock when the rest of the order is received?

Total air filters with complete order ____________

2. Jesse usually works between 20 to 35 hours a week at South End Auto Supply. The owner has asked Jesse to work more hours next week while a co-worker is on vacation. Total the number of hours Jesse will work next week using the following schedule:

Monday	12 hours
Tuesday	8 hours
Wednesday	8 hours
Thursday	12 hours
Friday	8 hours
Saturday	8 hours

Total number of hours ____________

3. There are 13 large boxes, 7 medium boxes, and 11 small boxes in the receiving area. How many boxes are in the receiving area?

Total number of boxes ____________

4. If a customer paid $250 for parts, $65 for tools, and $37 for miscellaneous supplies, how much was the total cost?

Total cost of purchase ____________

5. Leah wants to build a small display to promote motor oil. She has decided to place eight cans on the bottom, followed with 7 cans on the next row, then 6, 5, 4, 3, 2, and finally 1 can on the top row. How many cans of oil will Leah need to construct her pyramid?

Total number of cans ____________

6. J & B Parts House is running a special on tires. The owner has told the employees that the individual who sells the most tires will earn a 5% commission. With one week remaining, the employees have sold the following amounts: Marcus, 12; Ben, 10; Leah, 12; Joe, 16; and Shandra, 8. How many tires have been sold?

Total number of tires sold ____________

Assignment Sheet 1

7. Using the number of tires sold listed in Problem 6 and the numbers given below, total the number of tires sold by each employee at the end of the contest.

   The final week of sale, the employees sold the following: Marcus 8; Ben, 10; Leah, 14; Joe, 8; and Shandra, 11.

   a. Marcus ____________
   b. Ben ____________
   c. Leah ____________
   d. Joe ____________
   e. Shandra ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 2—Subtract Whole Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	_____
Labeled answers with correct unit of measurement	_____
Computed a minimum of 16 of the 19 answers correctly	_____

Directions: Solve the following subtraction problems.

Examples:

12	Original Number	57	Original Number
– 7	Subtracted Number	– 35	Subtracted Number
+ 5	Answer (Difference)	+ 22	Answer (Difference)
12	Check Answer (Same as Original Number)	57	Check Answer

A. Solve each of the following subtraction problems. Check your answer by adding the difference to the subtracted number. Show your work.

1. 9 – 5	2. 15 – 8	3. 75 –22	4. 453 – 47	5. 742 – 318
6. 981 – 698	7. 1420 – 245	8. 3459 –1649	9. 55722 – 4272	10. 98679 – 8957

Assignment Sheet 2

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. If you need $100 to set up your cash drawer and you only have $46, how much additional money would you need?

   Total amount of money needed ____________

2. If you have sixteen boxes in shipping and receiving and five of those boxes are to be shipped, how many boxes will remain?

   Number of boxes remaining ____________

3. Leah worked 36 hours this week and Marcus worked 56 hours. How many more hours did Marcus work than Leah?

   Difference in hours worked ____________

4. In the first year of operation, J & B Parts House sold 1219 parts. During the second year, 2167 parts were sold. How many more parts were sold the second year?

   Difference in parts sold ____________

Assignment Sheet 2

5. Joe makes parts deliveries for J & B Parts House. Determine the number of miles Joe drove in a five week period.

Week	1	2	3	4	5
Reading (start)	32,119	32,899	33,988	35,976	37,065
Reading (end)	32,899	33,988	35,976	37,065	39,001

Week 1 ________________

Week 2 ________________

Week 3 ________________

Week 4 ________________

Week 5 ________________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 3—Multiply Whole Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 16 of the 18 answers correctly	______

Directions: Solve the following multiplication problems.

Examples:

$$\begin{array}{r} \\ 8 \\ \underline{\times\ 7} \\ 56 \end{array} \qquad \begin{array}{rl} \mathbf{1} & \leftarrow \text{Carried Digit} \\ 53 & \\ \underline{\times\ \ 4} & \\ 212 & \end{array} \qquad \begin{array}{rl} \mathbf{11} & \leftarrow \text{Carried Digits} \\ 756 & \\ \underline{\times\ 312} & \\ 1512 & \leftarrow \text{First Partial Product} \\ 756 & \leftarrow \text{Second Partial Product} \\ \underline{2266} & \leftarrow \text{Third Partial Product} \\ 235872 & \leftarrow \text{Product} \end{array}$$

A. Solve each of the following multiplication problems. Show your work.

1. $\begin{array}{r} 6 \\ \underline{\times 7} \end{array}$ 2. $\begin{array}{r} 9 \\ \underline{\times 8} \end{array}$ 3. $\begin{array}{r} 54 \\ \underline{\times\ 6} \end{array}$ 4. $\begin{array}{r} 721 \\ \underline{\times\ \ 4} \end{array}$ 5. $\begin{array}{r} 1682 \\ \underline{\times\ \ \ 5} \end{array}$

6. $\begin{array}{r} 78 \\ \underline{\times 26} \end{array}$ 7. $\begin{array}{r} 453 \\ \underline{\times\ 47} \end{array}$ 8. $\begin{array}{r} 314 \\ \underline{\times 527} \end{array}$ 9. $\begin{array}{r} 2143 \\ \underline{\times\ 235} \end{array}$ 10. $\begin{array}{r} 4123 \\ \underline{\times 1324} \end{array}$

Assignment Sheet 3

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. There are 24 cans of motor oil in a case. How many cans in 6 cases?

   Number of cans ____________

2. In addition to the owner, there are 5 employees at J & B Parts House. If each employee works 8 hours and the owner works 10 hours, how many hours have been worked?

   Total number of hours worked ____________

3. If it takes an average of 15 minutes to wait on a customer, how many minutes would it take to wait on 28 customers?

   Total number of minutes ____________

4. If a high quality chamois costs $25, how much would 17 of them cost?

   Total cost ____________

Assignment Sheet 3

5. Leah worked 36 hours last week. If Leah earns $5 an hour, how much did Leah earn last week?

   Salary earned ____________

6. Figure the amount of time worked in 4 weeks by 5 parts specialists who worked 35 hours each week.

   Total amount of time worked ____________

7. Joe travels approximately 250 miles a day making deliveries. If Joe works six days a week for the next four weeks, how many miles would Joe have traveled?

   Total number of miles traveled ____________

8. M.L. has just purchased 20 gallons of detergent for his automatic car wash. If one gallon washes 26 cars, how many cars will 20 gallons of detergent wash?

   Total number of cars washed ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 4—Divide Whole Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 14 of the 16 answers correctly	______

Directions: Solve the following division problems.

Examples:

Answer
Divisor)Original Number

324
3)972
9
7
6
12
12

0111 Answer
51)5678
51
57
51
68
51
17 Remainder

Check:

111 Answer
× 51 Divisor
111
555
5661
+ 17 Remainder
5678 Original Number

Assignment Sheet 4

A. Solve each of the following division problems. Check your answers by multiplying the divisor by the original number. Show your work.

1. $2\overline{)8}$
2. $6\overline{)48}$
3. $9\overline{)819}$
4. $4\overline{)1248}$
5. $13\overline{)39}$
6. $66\overline{)198}$
7. $84\overline{)5212}$
8. $124\overline{)345}$
9. $464\overline{)829}$
10. $746\overline{)2872}$

B. Solve the following problems. Show your work in the spaces provided. Write your answer on the blanks.

1. If 50 cans of car wax cost $150, how much would a single can cost?

   Cost of can ____________

Assignment Sheet 4

2. Jesse earns $280 a week when he works 40 hours per week. How much does Jesse earn per hour?

   Amount earned per hour ____________

3. J & B Parts House has 2,483 parts catalogs. Approximately 116 are included with orders each day. How many days will the supply of catalogs last?

   Number of days ____________

4. Four new computers, accessories, and software have been ordered for J & B Parts House at a cost of $26,400 (including interest). How much will the monthly payment be if the equipment is financed over a 60-month period?

   Amount of monthly payment ____________

5. Employees of J & B Parts House decided to have pizza delivered for lunch. Since there are 5 employees, everyone agreed that two large pizzas would be needed. They asked that each pizza be cut into 10 equal pieces so that everyone would get an equal share. How many slices of pizza did each employee get?

   Number of slices ____________

Assignment Sheet 4

6. Marcus needs to save $280 to buy a new set of tires for his '90 Ford Mustang. How much money does Marcus need to save each week if he wants the new tires in eight weeks?

Amount of money to be saved each week ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 5—Reduce Fractions to Lowest Terms

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	_____
Labeled answers with correct unit of measurement	_____
Computed a minimum of 8 of the 10 answers correctly	_____

Directions: Reduce the following fractions to their lowest terms.

Examples: $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$ $\frac{12}{32} = \frac{12 \div 4}{32 \div 4} = \frac{3}{8}$

A. $\frac{4}{8}$ = __________

B. $\frac{8}{16}$ = __________

C. $\frac{2}{2}$ = __________

D. $\frac{4}{16}$ = __________

E. $\frac{12}{48}$ = __________

F. $\frac{9}{24}$ = __________

G. $\frac{16}{32}$ = __________

H. $\frac{2}{4}$ = __________

I. $\frac{9}{12}$ = __________

J. $\frac{50}{100}$ = __________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 6—Convert Fractions and Mixed Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 30 of the 35 answers correctly	______

Directions: Convert the following fractions and mixed numbers. Reduce to lowest terms when possible.

A. Distinguish among the following fractions by writing a "P" in the blanks before a proper fraction, an "I" before an improper fraction, and an "M" in the blanks before a mixed number.

______1. $\frac{1}{2}$

______2. $3\frac{7}{8}$

______3. $\frac{16}{2}$

______4. $3\frac{1}{8}$

______5. $\frac{1}{4}$

______6. $\frac{1}{1}$

______7. $\frac{7}{2}$

______8. $8\frac{1}{2}$

______9. $\frac{4}{4}$

______10. $9\frac{3}{16}$

______11. $5\frac{1}{2}$

______12. $\frac{9}{8}$

______13. $\frac{9}{4}$

______14. $\frac{1}{8}$

______15. $16\frac{3}{4}$

Assignment Sheet 6

B. Convert each of the following mixed numbers to improper fractions. Reduce to lowest terms when possible.

1. $3\frac{1}{4}$ = ____________
2. $4\frac{1}{2}$ = ____________
3. $7\frac{3}{4}$ = ____________
4. $8\frac{1}{2}$ = ____________
5. $6\frac{1}{8}$ = ____________
6. $5\frac{2}{4}$ = ____________
7. $4\frac{1}{4}$ = ____________
8. $8\frac{1}{2}$ = ____________
9. $9\frac{1}{4}$ = ____________
10. $16\frac{1}{2}$ = ____________

C. Convert each of the following improper fractions to mixed numbers. Reduce to lowest terms when possible.

1. $\frac{7}{4}$ = ____________
2. $\frac{9}{2}$ = ____________
3. $\frac{6}{4}$ = ____________
4. $\frac{15}{18}$ = ____________
5. $\frac{19}{16}$ = ____________
6. $\frac{11}{8}$ = ____________
7. $\frac{75}{32}$ = ____________
8. $\frac{5}{2}$ = ____________
9. $\frac{15}{4}$ = ____________
10. $\frac{33}{16}$ = ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 7—Add Fractions

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 10 of the 12 answers correctly	______

Directions for adding like fractions:

Example: Add $\frac{3}{4}$ and $\frac{3}{4}$.

1. Add the numerators.

   Example: $3 + 3 = 6$

2. Place answer over common denominator and reduce to lowest terms if necessary.

   Example: $\frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$ Answer

Directions for adding unlike fractions:

Example: Add $\frac{1}{4} + \frac{7}{8}$.

1. Change to equivalent fractions with lowest common denominator.

   Example: $\frac{7}{8}$ remains the same, as 8 is lowest common denominator.

   $\frac{1}{4}$ is multiplied by $\frac{2}{2}$, or $\frac{1}{4} \times \frac{2}{2} = \frac{2}{8}$.

2. Add the new numerators.

   Example: $\frac{7 + 2}{8} = \frac{9}{8}$

Assignment Sheet 7

3. Change improper fraction to mixed number and reduce to lowest terms if necessary.

   Example: $\frac{9}{8} = 9 \div 8 = 1\frac{1}{8}$ Answer

Directions for adding mixed numbers:

Example: Add $3\frac{5}{8} + 7\frac{5}{8}$.

1. Add numerators.

   Example: $\frac{5+5}{8} = \frac{10}{8}$

2. Change improper fraction to mixed number and reduce to lowest terms if necessary.

   Example: $\frac{10}{8} = 10 \div 8 = 1\frac{2}{8} = 1\frac{1}{4}$

3. Add whole numbers and fractions.

   Example: $3 + 7 + 1 + \frac{1}{4} = 11\frac{1}{4}$ Answer

A. Add the following fractions. Show your work in the space provided below the problems. Reduce to lowest terms if necessary. Write your answers on the blanks beside the problems.

1. $\frac{7}{16} + \frac{5}{16} =$ ________
2. $\frac{5}{8} + \frac{7}{8} =$ ________
3. $\frac{1}{4} + \frac{2}{8} =$ ________
4. $\frac{4}{16} + \frac{3}{4} =$ ________
5. $\frac{9}{16} + \frac{5}{8} =$ ________
6. $\frac{5}{8} + \frac{5}{32} =$ ________
7. $\frac{3}{4} + \frac{5}{32} =$ ________
8. $\frac{7}{8} + \frac{6}{16} =$ ________
9. $\frac{9}{16} + \frac{3}{4} =$ ________
10. $\frac{4}{4} + \frac{25}{32} =$ ________

Assignment Sheet 7

B. Solve the following problems. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. Maria worked 4 1/2 hours before lunch and 3 1/4 hours after lunch. How many hours did Maria work?

   Number of hours worked ____________

2. Three dimensions are 1 1/16 inches, 2 3/8 inches, and 2 3/4 inches. What is the combined dimension?

   Number of inches ____________

Applied Math for Parts Specialist
Unit 5

Assignment Sheet 8—Subtract Fractions

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 32 of the 37 answers correctly	______

Directions for subtracting like fractions:

Example: Subtract $\frac{1}{16}$ from $\frac{7}{16}$.

1. Subtract smaller numerator from larger numerator.

   Example: $7 - 1 = 6$

2. Place answer over common denominator.

   Example: $\frac{6}{16}$

3. Reduce to lowest terms if required.

   Example: $\frac{6}{16} = \frac{3}{8}$ Answer

Directions for subtracting unlike fractions:

Example: Subtract $\frac{1}{2}$ from $\frac{3}{4}$.

1. Change to like fractions.

   Example: $\frac{3}{4}$ remains the same because 4 is the common denominator.

   $\frac{1}{2}$ is multiplied by $\frac{2}{2}$, or $\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$.

Assignment Sheet 8

2. Subtract as for like fractions and reduce to lowest terms if required.

   Example: $\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$ Answer

Directions for subtracting mixed numbers:

Example: Subtract $3\frac{1}{2}$ from $5\frac{1}{8}$.

1. Change mixed numbers to like fractions.

   Example: $3\frac{1}{2} = 3\frac{4}{8}$

2. Borrow a 1 from the original whole number if needed, and convert the 1 to a like fraction, and add it to the smaller fraction.

   Note: This step is needed only if the like fraction in the original number is smaller than the like fraction in the subtracted number.

   Example: $5\frac{1}{8} - 3\frac{4}{8} = (4\frac{8}{8} + \frac{1}{8}) - 3\frac{4}{8} = 4\frac{9}{8} - 3\frac{4}{8}$

3. Subtract whole number from whole number and like fraction from like fraction, and reduce answer to lowest terms if required.

   Example: $4\frac{9}{8} - 3\frac{4}{8} = 1\frac{5}{8}$ Answer

Directions for subtracting a fraction from a whole number:

Example: $4 - \frac{3}{16}$

1. Borrow 1 from whole number.

   Example: $4 - 1 = 3$

2. Change borrowed 1 to like fraction.

   Example: $1 = \frac{16}{16}$

3. Subtract as for like fractions and reduce answer to lowest terms if required.

   Example: $3\frac{16}{16} - \frac{3}{16} = 3\frac{13}{16}$ Answer

Assignment Sheet 8

A. Subtract the proper fractions given below. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $\frac{3}{4} - \frac{3}{16} =$ __________
2. $\frac{7}{8} - \frac{1}{4} =$ __________
3. $\frac{30}{32} - \frac{3}{4} =$ __________
4. $\frac{25}{32} - \frac{5}{8} =$ __________
5. $\frac{7}{8} - \frac{2}{16} =$ __________
6. $\frac{15}{16} - \frac{3}{8} =$ __________
7. $\frac{1}{2} - \frac{7}{16} =$ __________
8. $\frac{3}{4} - \frac{3}{8} =$ __________
9. $\frac{13}{16} - \frac{9}{32} =$ __________
10. $\frac{7}{8} - \frac{6}{16} =$ __________

B. Subtract the following fractions from whole numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $4 - \frac{3}{4} =$ __________
2. $7 - \frac{15}{16} =$ __________
3. $32 - \frac{13}{32} =$ __________
4. $175 - \frac{4}{5} =$ __________
5. $12 - \frac{61}{64} =$ __________

Assignment Sheet 8

C. Subtract the following mixed numbers from whole numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $2 - 1\frac{1}{3} =$ ______

2. $3 - 1\frac{3}{8} =$ ______

3. $18 - 9\frac{7}{8} =$ ______

4. $3 - 1\frac{21}{32} =$ ______

5. $27 - 1\frac{5}{16} =$ ______

6. $14 - 6\frac{3}{4} =$ ______

7. $5 - (3\frac{5}{32} + 1\frac{9}{32}) =$ ______

8. $8 - (1\frac{1}{4} + 5\frac{5}{8} + \frac{1}{16}) =$ ______

9. $4 - 3\frac{1}{3} =$ ______

10. $42 - 3\frac{7}{16} =$ ______

D. Subtract the following mixed numbers. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. $1\frac{3}{5} - 1\frac{1}{5} =$ ______

2. $72\frac{6}{16} - 22\frac{7}{16} =$ ______

3. $7\frac{5}{6} - 2\frac{1}{6} =$ ______

4. $18\frac{7}{8} - 9\frac{3}{8} =$ ______

Assignment Sheet 8

5. $35\frac{5}{8} - 8\frac{1}{2} =$ ____________

6. $5\frac{1}{4} - (1\frac{1}{8} + 1\frac{7}{8}) =$ ____________

7. $12\frac{1}{2} - (7\frac{1}{4} + 3\frac{1}{8}) =$ ____________

8. $4\frac{29}{32} - 1\frac{19}{32} =$ ____________

9. $5\frac{15}{32} - 2\frac{31}{32} =$ ____________

10. $8\frac{1}{16} - 4\frac{7}{8} =$ ____________

E. Solve the following word problems. Show your work in the spaces provided. Reduce to lowest terms if necessary. Write your answers on the blanks.

1. Ross had a 7/8-inch wrench. He needed a 3/4-inch wrench. How much difference is there in the size of the wrenches?

   Difference in inches ____________

2. Anita worked 2 1/4 hours assembling a storage shelf and Don worked 1 1/2 hours on the same installation. How much faster did Don work than Anita?

   Difference in hours ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 9—Multiply Fractions

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 9 of the 10 answers correctly	______

Directions: Solve the following multiplication problems.

Example: $\frac{2}{3} \times \frac{3}{4}$ becomes $\frac{2 \times 3}{3 \times 4} = \frac{6}{12} = \frac{1}{2}$

Multiply the following fractions. Convert mixed fractions where needed and reduce answers to lowest terms.

A. $\frac{1}{2} \times \frac{3}{4}$ = __________

B. $\frac{3}{8} \times \frac{5}{16}$ = __________

C. $1\frac{1}{2} \times 2\frac{1}{4}$ = __________

D. $\frac{1}{2} \times 6\frac{1}{2}$ = __________

E. $\frac{7}{8} \times \frac{2}{3}$ = __________

Assignment Sheet 9

F. $1\frac{1}{3} \times 2\frac{1}{4} \times \frac{1}{2} =$ __________

G. $\frac{1}{4} \times \frac{1}{3} \times \frac{1}{2} =$ __________

H. $2\frac{3}{4} \times 6\frac{1}{8} =$ __________

I. $\frac{5}{8} \times \frac{3}{4} =$ __________

J. $5\frac{5}{16} \times 4 =$ __________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 10—Add Decimal Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 35 of the 40 answers correctly	______

Directions: Solve the following decimal addition problems.

A. Write the name of the place for each *underlined* digit.

____________ 1. 867.$\underline{4}$3

____________ 2. 6.3$\underline{7}$892

____________ 3. 1.0000$\underline{8}$

____________ 4. 6.239$\underline{5}$

____________ 5. 0.47$\underline{6}$

B. Write the name of the place for the last digit in each of the following numbers.

____________ 1. 0.38

____________ 2. 0.4678

____________ 3. 321.9

____________ 4. 427.389

____________ 5. 44.67

Assignment Sheet 10

C. Underline the digit that is in the place named in italics.

1. 46.3826 *Hundredths*
2. 35.0038 *Ten thousandths*
3. 148.296 *Tenths*
4. 6758.23 *Hundredths*
5. 91.4082 *Thousandths*
6. 204.37 *Tens*
7. 14.0079 *Ones (units)*
8. 208.097 *Hundredths*
9. 5.23981 *Thousandths*
10. 502.967 *Tenths*
11. 5230.867 *Thousandths*
12. 587.029 *Ones (units)*
13. 0.298 *Hundredths*
14. 329.768 *Tens*
15. 52.694 *Thousandths*
16. 498.276 *Tenths*
17. 0.5296 *Ten thousandths*
18. 468.539 *Hundreds*
19. 324.06 *Tenths*
20. 567.8 *Ones (units)*

D. Set up the following groups of numbers in columns. Add each column, carrying when necessary and placing the decimal point correctly.

1. 0.024 + .165

2. 87.3 + 370

3. 15.127 + 3.4 + .0091 + 236.87

4. 195.7 + 83 + 9.006

5. .5280 + 435 + 179.50 + 1.9

Assignment Sheet 10

E. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. Maria earned $22.50 in commissions and Dan earned $16.50. How much did they earn together?

   Total amount earned ____________

2. On a parts order, one item costs $54.65 and another item costs $16.30. The tax on the order is $3.38. What is the total cost of the order?

   Total cost ____________

3. Leroy worked four days on an inventory project. He worked 6.8 hours Monday, 7.4 hours Tuesday, 5.3 hours Wednesday, and 4.4 hours Thursday. How many total hours did he work?

   Total hours worked ____________

4. Frank was cleaning out a storage bin. He found three partially used bottles of cleaning solvent, each containing the following amounts: 6.7 fl. ounces, 12.9 fl. ounces, and 5.2 fl. ounces. How many fluid ounces of cleaning solvent did Frank find?

   Total fluid ounces of solvent ____________

5. Six items have been returned to inventory and need to be credited to the customer's account. Costs of these items are 14.10, 6.80, 24.95, 3.25, 64.50, and 34.25. The tax paid on these items is $10.36. How much should the customer's account be credited?

   Total amount to be credited ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 11—Subtract Decimal Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 12 of the 15 answers correctly	______

Directions: Solve the following decimal subtraction problems.

A. Set up each of the following problems in column form. Subtract and check your work. Remember, when you subtract decimals, the decimal points must be aligned.

1. 868.87 – 516.89 = __________

2. 567 – 19.856 = __________

3. 198 – 56.987 = __________

4. 567.94 – 59.78 = __________

5. \$815.23 – \$65.98 = __________

Assignment Sheet 11

6. $20.03 – $15.88 = __________

7. 694.7 – 24.3 = __________

8. 5,000 – 892.66 = __________

9. $15 – $12.53 = __________

10. $219.30 – $21.85 = __________

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. A parts supplier received $8438.64 in December, and paid out $5121.32 in January. How much profit did the supplier make?

   Profit ____________

2. It takes 20.5 hours to finish a job. Joe has worked 6 hours. How much longer will it take him to finish the job?

   Hours required to finish job ____________

Assignment Sheet 11

3. A water cooler holds 49.2 liters of water. After a day, workers have drunk 8.7 liters. How much water is left in the cooler?

   Liters of water left in cooler ____________

4. While inspecting an order, Marcus notices that three items are damaged and need to be returned to supplier. The costs of these items are $45.68, 8.48, and 10.83. What is the total cost of these items?

   Total cost ____________

5. Keisha has been working overtime to help her employer set up the new computerized accounting system. Each of the following days, Keisha worked additional hours: Monday, 2.5 hours; Tuesday, 1.75 hours; Wednesday, 2.5 hours; Thursday, 3.25 hours; Friday, 1.75 hours; and Saturday, 6.5 hours. How many hours of overtime did Keisha earn that week?

   Number of overtime hours earned ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 12—Multiply Decimal Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	Rating
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 13 of the 15 answers correctly	______

Example:
16.11 2 Decimal Places
× 2.2 1 Decimal Place
3222
3222
35.442 3 Decimal Places in Answer

A. Set up each of the following problems in column form and multiply. Locate the decimal point in the answer.

1. 2.64 × 3.1 = __________

2. 120 × 0.33 = __________

3. 2.25 × 0.51 = __________

4. 35 × 8.5 = __________

5. 26.4 × 3.8 = __________

Assignment Sheet 12

6. 7.02 × 0.92 = __________

7. 0.83 × 0.55 = __________

8. 28.2 × 0.9 = __________

9. 0.069 × 0.01 = __________

10. 7.52 × 3.01 = __________

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. An item is placed on sale for 25 percent off. By what amount is the price reduced if the regular price is $169.35?

   Note: Twenty-five percent is the same as the decimal .25.

   Price reduction ____________

2. The average cost of a replacement part is $41.25. During the year, the mechanic installs 150 such parts. What is the total cost?

   Total average cost ____________

3. What is the total distance traveled at 1.3 km/h if the trip took .6 hours?

   Kilometers traveled ____________

Assignment Sheet 12

4. What is the cost of 15 gallons of solvent at $1.13 per gallon?

   Total cost ____________

5. J & B Parts House is adding a storage area 16.4 meters long by 11.5 meters wide. How many square meters will the area be?

   Number of square meters ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 13—Divide Decimal Numbers

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 13 of the 15 answers correctly	______

A. Divide numbers in the following problems. Show your work. Write your answers on the blanks provided.

1. $4.5 \div 0.5 =$ __________

2. $4.96 \div 0.4 =$ __________

3. $19.8 \div 0.6 =$ __________

4. $10.71 \div 0.07 =$ __________

5. $0.225 \div 0.15 =$ __________

6. $1.7608 \div 0.0062 =$ __________

Assignment Sheet 13

7. 0.48 ÷ 0.6 = __________

8. 0.125 ÷ 0.25 = __________

9. 0.9 ÷ 0.003 = __________

10. 1.16 ÷ 2.9 = __________

B. Solve the following word problems. Show your work in the spaces provided. Write your answers on the blanks.

1. What is the approximate cost per part if the cost of twelve parts is $103.68?

   Approximate cost ____________

2. How many hours did Shandra work if she was paid a total of $365.75 at the rate of $10.45 per hour?

   Total hours ____________

3. How many customers can be waited on in 21.12 hours if the average customer takes .066 hours?

   Number of customers ____________

4. Tran spent $172.80 for parts. What was the cost per piece if he bought eight pieces of equally priced parts?

   Cost per part ____________

Assignment Sheet 13

5. Mitch bought a set of tires for $156.81, but he only had $36 in cash. Mitch asked if he could make 3 equal payments to pay the balance owed and the store manager agreed. How much did Mitch owe per month?

   Amount owed per month ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 14—Use a Decimal Equivalent Chart

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Demonstrated proper use of chart	______
Answered a minimum of 8 out of 10 items correctly	______

Introduction: Many times in a parts specialist's career, while dealing with shim stock, other metal thickness, drill bit size, and a variety of other occasions it will be necessary to consult a decimal equivalent chart. This assignment is designed to help you sharpen those skills.

Directions: Using the decimal equivalent chart, write decimal equivalents as fractions and fractions as decimal equivalents in the following problems.

A. Locate and list the decimal equivalent for the fractional sizes listed below:

1. $\frac{1}{16}$ = __________
2. $\frac{7}{8}$ = __________
3. $\frac{1}{4}$ = __________
4. $\frac{1}{2}$ = __________
5. $\frac{9}{16}$ = __________

B. Locate and list the fractional size for the decimal equivalents listed below:

1. 0.4375 = __________
2. 0.1325 = __________
3. 0.375 = __________
4. 0.125 = __________
5. .6875 = __________

Assignment Sheet 14

Decimal Equivalent Chart

1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.1250	5/8	.6250
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.671875
3/16	.1875	11/16	.6875
13/64	.203125	45/64	.703125
7/32	.21875	21/32	.71875
15/64	.234375	47/64	.734375
1/4	.2500	3/4	.7500
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	.3125	13/16	.8125
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	.3750	7/8	.8750
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	.4375	15/16	.9375
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	.5000	1	.1000

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 15—Convert Fractions and Percentages

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measurement	______
Computed a minimum of 54 of the 60 answers correctly	______

Directions: Solve the following conversion problems.

A. Express each of the following fractions as a decimal.

1. $\frac{1}{8}$ = __________
2. $\frac{1}{4}$ = __________
3. $\frac{1}{2}$ = __________
4. $\frac{3}{4}$ = __________
5. $\frac{5}{8}$ = __________
6. $\frac{1}{16}$ = __________
7. $\frac{3}{32}$ = __________
8. $\frac{7}{8}$ = __________
9. $\frac{9}{16}$ = __________
10. $\frac{15}{16}$ = __________

Assignment Sheet 15

B. Express each of the following fractions as a percentage.

1. $\frac{1}{4}$ = ______
2. $\frac{1}{2}$ = ______
3. $\frac{7}{10}$ = ______
4. $\frac{3}{4}$ = ______
5. $\frac{2}{2}$ = ______
6. $\frac{1}{10}$ = ______
7. $\frac{7}{8}$ = ______
8. $\frac{5}{10}$ = ______
9. $\frac{1}{3}$ = ______
10. $\frac{5}{8}$ = ______

C. Match the decimal numbers on the right with their correct equivalent fractions. Write the correct letters in the blanks.

______1. $5\frac{6}{10}$

______2. $1\frac{2}{100}$

______3. $\frac{87}{1000}$

______4. $7\frac{83}{1000}$

______5. $5\frac{6}{100}$

______6. $5\frac{6}{1000}$

______7. $78\frac{3}{10}$

______8. $87\frac{7}{10}$

______9. 102

______10. $\frac{783}{1000}$

a. 7.083

b. 5.006

c. 78.3

d. 0.087

e. 0.783

f. 87.7

g. 5.6

h. 102.0

i. 5.06

j. 1.02

Assginment Sheet 15

D. Write decimal equivalents for each of the following fractions.

1. $63\frac{9}{10}$ = __________
2. $5\frac{93}{100}$ = __________
3. $5\frac{93}{1000}$ = __________
4. $5\frac{93}{10000}$ = __________
5. $3\frac{825}{1000}$ = __________
6. $38\frac{95}{100}$ = __________
7. $38\frac{95}{1000}$ = __________
8. $42\frac{3}{10}$ = __________
9. $402\frac{3}{10}$ = __________
10. $897\frac{97}{100000}$ = __________

E. Express each of the following percentages as a fraction. Reduce to the lowest terms.

1. 50% = __________
2. 25% = __________
3. $33\frac{1}{3}$% = __________
4. 36% = __________
5. 28% = __________
6. $14\frac{2}{7}$% = __________
7. 21% = __________
8. 75% = __________
9. $66\frac{2}{3}$% = __________
10. 70% = __________

Assignment Sheet 15

F. Express each of the following percentages as a decimal.

1. 47% = __________
2. 15% = __________
3. 33.3% = __________
4. 62% = __________
5. 75% = __________
6. 3% = __________
7. 16.8% = __________
8. 9% = __________
9. 10% = __________
10. 50% = __________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 16—Solve Percentage Problems

Name ______________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	_____
Labeled answers with correct unit of measurement	_____
Computed a minimum of 20 of the 24 answers correctly	_____

A. Calculate the answers to the following percentage problems.

1. What does it mean to say 100 percent of the work is completed? __________

   ____

2. There are 100 boxes in a carton. Twenty-five boxes are what percent of the boxes in the carton? ______________________

   Five boxes are what percent of the boxes in the carton? __________

3. There are 100 jobs on the agenda. Ninety-four have been completed. What percent of the jobs have been completed? ______________

4. If 94 of the jobs in the above problem have been completed, how many have not been? ______________________

   What percent has not been completed? ______________

5. If 11 percent of the students in a school are absent, what percent are present?

   ____

Assignment Sheet 16

6. If 6 percent of the reamers that a store had in stock were not sold, what percent were sold? ____________________

7. If 60 percent of the parts managers in town had assistants, what percent did not have assistants? ____________________

8. Hyun-lee has finished 75 percent of the job he is doing. What percent does he still have to do? ____________________

9. Marie has completed 40 percent of her training. What percent does she still have to do? ____________________

10. If you were told to complete 93 percent of the work, what percent would be left?

____

B. Solve each of the following percentage problems.

1. 3% of 72 is what number? ________
2. 5% of 18 is what number? ________
3. What number is 33⅓% of 96? ________
4. 40% of 125 is what number? ________
5. 68% of 63.5 is what number? ________
6. What number is 12½% of 140.8? ________
7. What number is 1% of 103? ________
8. What number is 37½% of 152? ________
9. 50% of 32.8 is what number? ________
10. 7% of 163 is what number? ________

Assignment Sheet 16

C. Solve the following percentage word problems.

1. There are 20 students in a class. Sixty percent of the students are boys. How many are boys? ________

2. One day 5 percent of the 20 students in Mr. Washington's group made perfect time completing a job. How many students made perfect time? ________

3. A technician bought a new power threader—regularly selling for $120—at a sale and saved 20 percent. How much money did he save? ________

4. The number of parts store managers at the meeting this year was 75 percent of what it was last year. Last year there were 800 managers at the meeting. How many managers were at the meeting this year? ________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 17—Compute Discounts and Sale Prices

Name ______________________________ Overall Rating __________

Evaluation criteria	**Rating**
Completed all problems and showed work	______
Labeled answers with correct unit of measure	______
Computed a minimum of 10 of the 12 answers correctly	______

Introduction: Many times in a parts specialist's career it will be necessary to compute discounts and sale prices. This assignment is designed to help you sharpen those skills.

Directions: Compute discounts and compute sales prices using discount and percent in the following problems. (Show all work.)

A. A set of wrenches marked to sell for $159.95 was put on sale at a discount rate of 15%. What is the selling price? ____________

B. What is the selling price of an article marked at $499.95 and selling at a discount of 23%? ____________

C. If an 18% discount is allowed on an article marked at $350.00, what is the selling price? ____________ What is the amount of the discount?____________

D. Automotible tires are on sale for 20% off. What will four tires cost if each tire regularly sells for $45.00? ____________ What is the discount per tire? ____________

Assignment Sheet 17

E. Mr. Matthews decided to decrease the price of an $89.50 lawn mower by 20%. What was the sale price? ____________

F. At a sale a sign read "20% off on all floor mats." How much did Joan save on a mat which sells for $35? ____________

G. A set of driving lights priced at $18.95 were sold for $13.95. What was the discount? ____________

H. A pair of shock absorbers priced at $30 was reduced $10 in price. What is the percent of discount? ____________

I. A steel belted radial tire originally sold for $60. Jim bought it for 40% off. What did he pay for the tire? ____________

J. Jeanette had a $45 muffler installed on her pickup truck during a 15% off sale. How much did she pay for the muffler? ____________

Applied Math for Parts Specialists
Unit 5

Assignment Sheet 18—Use the English/Metric Conversion Chart

Name ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Demonstrated proper use of chart	______
Computed all answers correctly	______

Introduction: Many times in a parts specialist's career, particularly with the variety of products containing both metric and SAE fasteners, it will be necessary to consult an English/Metric conversion chart. This assignment is designed to help you sharpen those skills.

Directions: Using the conversion chart, locate the conversion factor and compute the following problems. (Show all work).

A. An order is placed for 100 liters of anti-freeze/coolant. How many gallons equal 100 liters? __________

B. A shop calls the parts counter and orders a head gasket for a foreign car and during the conversation the mechanic says that the specifications call for 115 newton-meters of torque on the head bolts, but his torque wrench reads in foot-pounds of torque. How many foot-pounds should the head be torqued to? __________

C. The parts counter is 15 feet long. How many meters long is the parts counter? __________

Assignment Sheet 18

	When You Know	You Can Convert To	When You Multiply By
Length	Inches	Millimeters (mm)	25.4
	Millimeters	Inches	0.04
	Inches	Centimeters (cm)	2.54
	Centimeters	Inches	0.4
	Inches	Meters (m)	0.0254
	Meters	Inches	39.37
	Feet	Centimeters	30.5
	Centimeters	Feet	4.8
	Feet	Meters	0.305
	Meters	Feet	3.28
	Miles	Kilometers (km)	1.61
	Kilometer	Miles	0.62
Area	Inches^2	Millimeters^2 (mm^2)	645.2
	Millimeters^2	Inches^2	0.0016
	Inches^2	Centimeters^2 (cm^2)	6.45
	Centimeters^2	Inches^2	0.16
	Foot^2	Meters^2 (m^2)	0.093
	Meters^2	Foot^2	10.76
Capacity-Volume	Ounces	Milliliters (ml)	30
	Milliliters	Ounces	0.034
	Pints	Liters (l)	0.47
	Liters	Pints	2.1
	Quarts	Liters	0.95
	Liters	Quarts	1.06
	Gallons	Liters	3.8
	Liters	Gallons	0.26
	Cubic Inches	Liters	0.0164
	Liters	Cubic Inches	61.03
	Cubic Inches	Cubic Centimeters (cc)	16.39
	Cubic Centimeters	Cubic Inches	0.061
Weight (Mass)	Ounces	Grams	28.4
	Grams	Ounces	0.035
	Pounds	Kilograms	0.45
	Kilograms	Pounds	2.2
Force	Ounce	Newtons (N)	0.278
	Newtons	Ounces	35.98
	Pound	Newtons	4.448
	Newtons	Pound	0.225
	Newtons	Kilograms (KG)	0.102
	Kilograms	Newtons	9.807
Acceleration	Inch/Sec^2	Meter/Sec^2	.0254
	Meter/Sec^2	Inch/Sec^2	39.37
	Foot/Sec^2	Meter/Sec^2 (m/s^2)	0.3048
	Meter/Sec^2	Foot/Sec^2	3.280
Torque	Pound-Inch (Inch Pound)	**Newton-Meters (N-M)**	**0.113**
	Newton-Meters	**Pound-Inch**	**8.857**
	Pound-Foot	**Newton-Meters**	**1.356**
	Newton-Meters	**Pound-Foot**	**.737**
Pressure	**Pound/sq. in. (PSI)**	**Kilopascals (kPa)**	**6.895**
	Kilopascals	**Pound/sq. in.**	**0.145**
	Inches of Mercury (Hg)	**Kilopascals**	**3.377**
	Kilopascals	**Inches of Mercury (Hg)**	**0.296**
Fuel Performance	**Miles/gal**	**Kilometers/liters (km/l)**	**0.425**
	Kilometers/liters	**Miles/gal**	**2.352**
Velocity	**Miles/hour**	**Kilometers/hr (km/h)**	**1.609**
	Kilometers/hour	**Miles/hour**	**0.621**
Temperature	Degrees Fahrenheit	Degrees Celsius	5/9 (F°−32)
	Degrees Celsius	Degrees Fahrenheit	9/5 (C°+32)=F

Automotive Parts and Systems Identification
Unit 6

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify the basic components of the various systems of an automobile and be able to solve problems relating system parts to practical applications. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match basic systems of an automobile with their correct definitions.
2. Identify the basic components of an automobile engine.
3. Identify the components of a typical carbureted fuel system.
4. Identify the components of a typical fuel-injected fuel system.
5. Identify the components of a typical cooling system.
6. Identify the components of a typical heating system.
7. Identify the components of a typical air-conditioning system.
8. Identify the components of a conventional ignition system.
9. Identify the components of an electronic ignition system.
10. Identify the components of a typical starting system.
11. Identify the components of a typical charging system.
12. Identify the components of a typical exhaust system.
13. Identify the components of a typical emission control system.
14. Identify the components of a conventional two-wheel drive train.
15. Identify the components of a typical four-wheel drive train.
16. Identify the components of a typical front-wheel drive train.

Objective Sheet

17. Identify the components of a typical rear-wheel drive front suspension system.

18. Identify the components of a McPherson strut suspension system.

19. Identify the components of a conventional steering system.

20. Identify the components of a power steering system.

21. Identify the components of a typical rack-and-pinion steering system.

22. Identify the components of a disc brake system.

23. Identify the components of a body system.

24. Analyze situations to determine correct motor oil selection. (Assignment Sheet 1)

25. Analyze situations to determine possible engine problems. (Assignment Sheet 2)

26. Analyze situations to determine possible cooling/heating system problems. (Assignment Sheet 3)

27. Analyze situations to determine exhaust system problems. (Assignment Sheet 4)

28. Analyze situations to determine battery and charging system problems. (Assignment Sheet 5)

29. Answer questions related to brake systems. (Assignment Sheet 6)

Automotive Parts and Systems Identification
Unit 6

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Also note suggested resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Arrange for a local mechanic to visit the class to discuss this unit's various automotive systems and their parts.
- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match basic systems of an automobile with their correct definitions.

- Read and discuss with students the terms and definitions presented in this section of the information sheet. **(Reading/listening for content)**

Objectives 2 through 23

- Introduce the unit by first familiarizing class members with the basic theory of the four-cycle gasoline engine and how it converts chemical energy into mechanical energy. Use any number of texts from encyclopedias to various auto reference manuals to obtain basic information on the four-cycle engine. Invite a local mechanic or shop teacher to address the class on this subject. **(Listening for content; applying technical knowledge to practical applications)**

- Using transparency masters provided in this unit, go over the basic systems of an automobile, objective by objective, explain how the parts interrelate and how proper maintenance of each is important for the overall efficient and safe operation of the vehicle. Engage the class in discussions to determine each member has a grasp of this information. **(Listening for content; orally expressing ideas)**

- Distribute Student Supplements 1 through 6 as needed to supplement the various identification objectives. Read and discuss the sheets with the students to ensure their understanding of the material. Assign reports on various subjects covered in the supplements to allow students to delve into the material for themselves. **(Reading/listening for content; writing; critical thinking; reading for comprehension)**

- Distribute Assignment Sheets 1 through 6 as appropriate to sample the students' understanding of material presented. Read and discuss directions and evaluation criteria. Answer any questions, then have students complete assignments. **(Reading/listening for content; writing)**

Suggested Activities

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores on the Unit Evaluation Form.
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Chilton's Repair Manual.* Escort, Lynx, Tempo, Topaz, 1981-1990. Radnor, PA: Chilton Book Co., 1990.
- Crouse, William H. and Donald L. Anglin. *Automotive Brakes, Suspension, and Steering*, New York, NY: Gregg Division/McGraw-Hill Book Co., 1983.
- Ellinger, Herbert E. and Richard B. Hathaway. *Automotive Suspension and Steering*, Englewood Cliffs, NJ: Prentice-Hall, 1989.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management.* Albany, NY: Delmar Publishers, Inc., 1989.
- *1994 Advance Product Information*, Chevrolet Motor Division, Warren MI: General Motors Corp., 1993.
- *4.3 (L35) CPI Fuel System Operation and Diagnosis.* Warren, MI: Service Technology Group, General Motors Corp., 1991.

Automotive Parts and Systems Identification
Unit 6

Answers to Assignment Sheets

Assignment Sheet 1

1. a. SG
   b. SH

2. a. SAE 40 would not be a good choice in cold weather regardless of the price.
   b. 5W30, because of its low temperature ability to lubricate

3. a. Neither SG nor SH ratings apply for diesel applications.
   b. An oil with an API rating of "C"

4. a. All oils rated SC and higher (SD, SE, SF, SG, and SH) are suited for the purpose. Any oil labeled with the API "sunburst" label would meet the needs of this engine.
   b. No, because available SC and higher oils will provide more than adequate lubrication and cleaning.

5. a. Detergents keep harmful engine deposits, chemicals, and ash in suspension so they may be trapped in the oil filter to be removed at a regular oil and filter change.
   b. Either: cooling or cleaning

Assignment Sheet 2

1. Any five of the following in any order:

   a. Worn spark plugs
   b. Broken spark plug wire(s)
   c. Improper ignition timing
   d. Dirty air cleaner, vacuum leaks
   e. Improperly inflated tires
   f. Slippage in clutch or automatic transmission

2. a. Ignition timing
   b. Octane of fuel in use

3. a. Dirty carburetor
   b. Dirty fuel filter
   c. Faulty accelerator pump in carburetor

4. a. Ignition timing
   b. Spark plug wires
   c. Emission system

Answers to Assignment Sheets

5. a. Ice or water in the carburetor, fuel pump, fuel lines, or fuel tank
   b. Keep the fuel tank full (and/or treat the fuel with an anti-icing compound)

Assignment Sheet 3

1. a. Other hoses involved in the cooling system
   b. New hose clamps

2. a. Heater core
   b. Coolant level in radiator

3. a. Radiator pressure cap
   b. A broken radiator hose

4. a. Thermostat
   b. Heater core
   c. Heater/coolant supply valve

5. Plain water will cause rust within the cooling system which can clog radiators, thermostats and heater cores.

Assignment Sheet 4

1. Carbon monoxide poisoning can result from using a faulty exhaust system.

2. A description of the vehicle, make, model, and Vehicle Identification Number

3. The catalytic converter

4. a. Reduces noise
   b. Improves engine performance

Assignment Sheet 5

1. a. A discharged or "weak" battery
   b. Rusted or corroded battery cables (in any order)

2. a. Addition of distilled water to bring electrolyte level up to normal
   b. A condition of overcharge may have occurred because of a faulty voltage regulator

3. A "dead" cell within the battery (particularly after three years)

4. a. Physical size (will it fit?)
   b. Electrical capacity (will it handle the load of the vehicle's electrical system?)

Answers to Assignment Sheets

5. A direct exchange for a remanufactured starter

6. Alternators were not used on mass-production vehicles before 1964.

7. A corroded or rusted battery cable

Assignment Sheet 6

1. a. Drum brakes
   b. Disc brakes

2. a. Resist fading when heated
   b. Resist fading when wet
   c. Less likely to pull (and are self-adjusting)

3. a. The manufacturer's recommendation of the DOT rating brake fluid to use
   b. Heat

4. To prevent uneven braking which could be caused by a renewed brake being more efficient than one with considerable wear

5. a. Asbestos
   b. Semi-metallic

Automotive Parts and Systems Identification
Unit 6

Answers to Written Test

1. a. 1
   b. 11
   c. 3
   d. 4
   e. 9
   f. 5
   g. 7
   h. 8
   i. 10
   j. 6

2. a. Timing chain
   b. Water pump
   c. Timing chain cover
   d. Counterbalance shaft
   e. Alternator
   f. Throttle plate
   g. Throttle position sensor
   h. Intake manifold
   i. Fuel injection air horn
   j. Fuel injector
   k. Push rod
   l. Rocker arm
   m. Ignition coil
   n. Rocker arm cover
   o. Distributor
   p. Valve lifter spring
   q. Cylinder head
   r. Exhaust manifold
   s. Starter solenoid
   t. Starter motor
   u. Valve
   v. Piston
   w. Connecting rod
   x. Cylinder block
   y. Oil pump
   z. Oil pan
   aa. Hydraulic valve lifter
   bb. Crankshaft
   cc. Crankshaft gear
   dd. Crankshaft dampener pulley
   ee. Camshaft gear
   ff. Camshaft
   gg. Oil filter

Answers to Written Test

3. a. Air cleaner
   b. Fuel filter
   c. Carburetor
   d. Fuel line
   e. Fuel pump
   f. Fuel tank

4. a. Air cleaner
   b. Mass air flow sensor
   c. Throttle position sensor
   d. Throttle body assembly (air horn)
   e. Idle air control motor
   f. Cold start fuel injector
   g. Air intake manifold
   h. Fuel rail assembly
   i. Fuel pressure regulator
   j. Fuel filter
   k. Fuel pump
   l. Fuel injector
   m. Electronic control module
   n. Oxygen sensor
   o. Coolant temperature and thermo-time switches
   p. Manifold atmosphere pressure (MAP) sensor

5. a. Pressure cap
   b. Thermostat
   c. Fan
   d. Radiator
   e. Shroud
   f. Radiator hose
   g. V-belt
   h. Water pump
   i. Water jacket
   j. Fan clutch

6. a. Water pump
   b. Thermostat
   c. Water (coolant) control valve
   d. Heater hoses
   e. Heater plenum
   f. Heater core
   g. Blower
   h. Defroster
   i. Control system

Answers to Written Test

7. a. Condenser
   b. Receiver-drier (accumulator)
   c. Expansion valve
   d. Evaporator
   e. Compressor
   f. Low side service fitting (suction)
   g. High side service fitting (discharge)

8. a. Spark advance mechanism
   b. Condenser
   c. Contact points
   d. Breaker cam
   e. Spark plug
   f. Rotor
   g. Secondary ignition cable
   h. Primary resistance unit
   i. Ignition switch
   j. Distributor
   k. Ignition coil
   l. Primary ignition wire
   m. Distributor cap
   n. Battery

9. a. Resistor unit
   b. Control unit
   c. Ignition switch
   d. Ignition coil
   e. Distributor
   f. Armature
   g. Magnetic pickup assembly
   h. Distributor housing

10. a. Key switch
    b. Battery cable
    c. Battery
    d. Small gauge switch wire
    e. Starter solenoid
    f. Starter switch
    g. Starter motor

11. a. Ammeter
    b. Regulator
    c. Alternator
    d. Battery

Answers to Written Test

12. a. Manifold heat control valve
    b. Exhaust manifold
    c. Catalytic converter
    d. Muffler
    e. Resonator
    f. Tail pipe
    g. Crossover pipe
    h. Exhaust pipe
    i. Pipe clamps
    j. Pipe hangers

13. a. Charcoal canister
    b. Coolant control engine vacuum switch
    c. Distributor
    d. Intake manifold
    e. Exhaust gas recirculation control valve (EGR)
    f. Carburetor or fuel injection system
    g. Pressure-vacuum relief filter cap
    h. Catalytic converter
    i. PVC valve
    j. Electronic spark control computer
    k. Manifold converter
    l. Air pump

14. a. Clutch or torque converter
    b. Drive shaft
    c. Transmission
    d. Universal joints (U-joints)
    e. Wheels
    f. Differential

15. a. Constant velocity joints (CVJ)
    b. Live axles
    c. Drive shafts
    d. Universal joints (U-joints)
    e. Differential
    f. Transfer case

16. a. Transverse engine
    b. Half shafts
    c. Transaxle

Answers to Written Test

17. a. Adjusting shims
    b. Upper control arm inner bushings
    c. Lower control arm inner bushings and shaft
    d. Coil spring
    e. Stabilizer bar
    f. Lower control arm
    g. Shock absorber
    h. Rubber bumper
    i. Lower ball joint
    j. Steering knuckle
    k. Upper ball joint
    l. Upper control arm

18. a. Shock absorber
    b. Strut
    c. Spindle
    d. Sway bar
    e. Control arm
    f. Ball joint
    g. Coil spring
    h. Strut rod

19. a. Steering column
    b. Steering gear
    c. Pitman arm
    d. Idler arm
    e. Steering arm
    f. Tie rods
    g. Center link or relay link
    h. Steering knuckle
    i. Steering spindle bolt

20. a. Pump assembly
    b. Fluid line
    c. Control valve
    d. Tie rods
    e. Power cylinder

21. a. Pinion gear preload adjustment
    b. Pinion gear
    c. Rack lash adjustment
    d. Bellows
    e. Housing
    f. Rack
    g. Inner tie rod end

Answers to Written Test

22. a. Master cylinder
    b. Power booster
    c. Metering valve
    d. Pressure differential valve
    e. Proportioning valve
    f. Combination valve
    g. Rear drum or disc brake assembly
    h. Front rotor or disc assembly
    i. Outboard pad
    j. Inboard pad
    k. Caliper assembly
    l. Piston "O" ring
    m. Hose
    n. Brake lines

23. a. Instrument panel assembly
    b. Windshield header assembly
    c. Outer roof rail assembly
    d. Rear window panel assembly
    e. Rear compartment deck lid
    f. Rear end panel assembly
    g. Shroud and dash assembly
    h. Rocker panel assembly
    i. Door assembly
    j. Underbody assembly (floor pan)
    k. Rear quarter panel assembly

Automotive Parts and Systems Identification
Unit 6

Written Test

Name ______________________________ Score ______________

1. Match the basic systems of an automobile with their correct definitions. Write the numbers on the blanks provided.

_____a. Outer shell that provides protected area for auto components, people, luggage, etc.

_____b. Converts electrical power from the battery into mechanical energy to crank the engine

_____c. Recharges the battery and maintains a supply of electrical current to meet the operating needs of the automobile

_____d. Keeps the engine at its most efficient operating temperature during all engines speeds and driving conditions

_____e. Supplies a combustible mixture of air and fuel to the engine cylinders to meet all driving conditions

_____f. Delivers the power developed by the engine through clutch or torque converter and transmission to the drive shaft, differential to the wheels for motion

_____g. A machine that converts fuel into heat energy which produces mechanical force and motion

_____h. Conducts burned gases away from the engine and passenger compartment through catalytic converter, muffler, and pipes

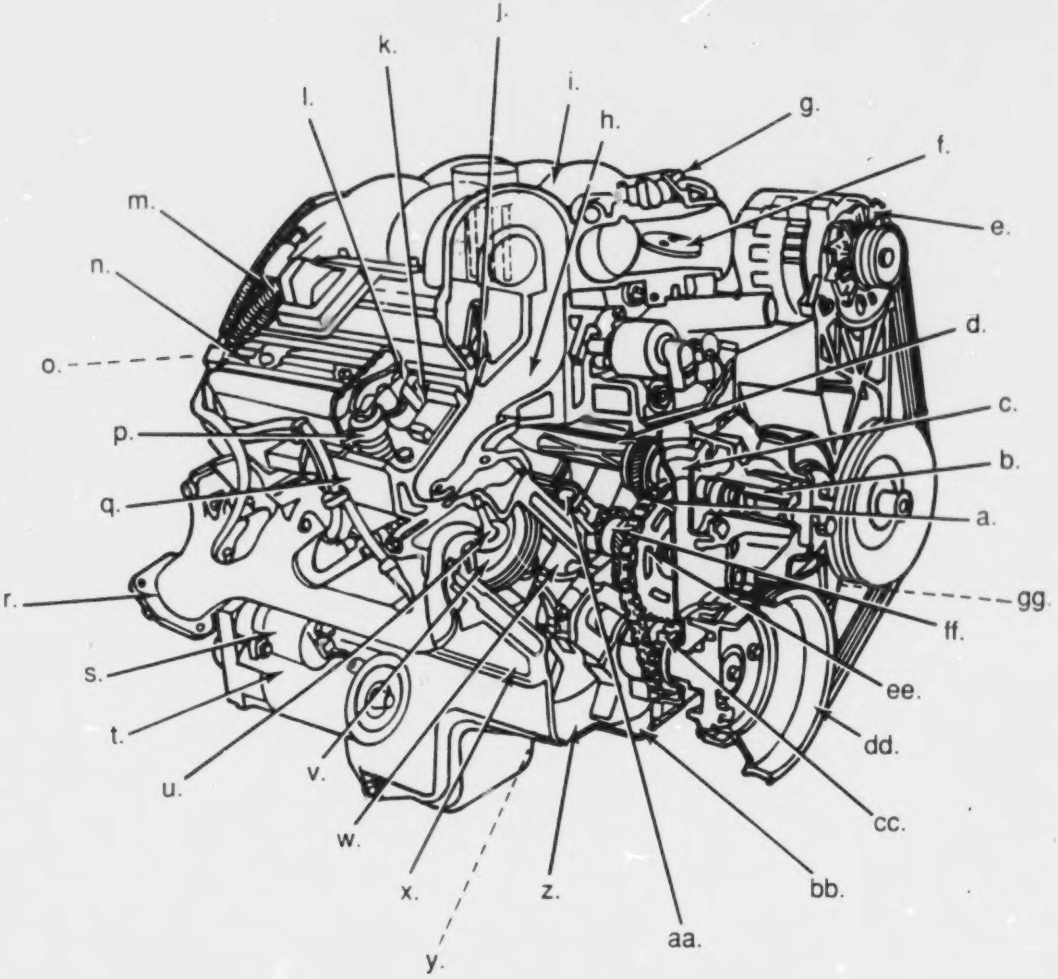
_____i. Provides a high voltage spark to ignite the fuel-air mixture in the combustion chamber

_____j. Devices on an automobile to control air pollution

1. Body system
2. Brake system
3. Charging system
4. Cooling system
5. Drive train
6. Emission control system
7. Engine
8. Exhaust system
9. Fuel system
10. Ignition system
11. Starting system

Written Test

2. Identify the basic components of an automobile engine. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.


j.
k.
i.
l.
h.
g.
f.
m.
e.
n.
d.
o.
c.
p.
b.
q.
a.
r.
gg.
ff.
s.
ee.
t.
dd.
u.
v.
cc.
w.
x.
z.
bb.
aa.
y.

Courtesy of General Motors Corporation, Service Technology Group

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Written Test

a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

k. ____________________

l. ____________________

m. ____________________

n. ____________________

o. ____________________

p. ____________________

q. ____________________

r. ____________________

s. ____________________

t. ____________________

u. ____________________

v. ____________________

w. ____________________

x. ____________________

y. ____________________

z. ____________________

aa. ____________________

bb. ____________________

cc. ____________________

dd. ____________________

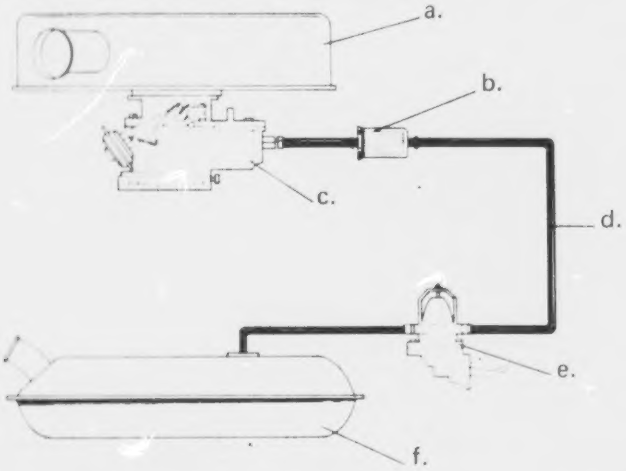
ee. ____________________

ff. ____________________

gg. ____________________

Written Test

3. Identify the components of a typical carbureted fuel system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



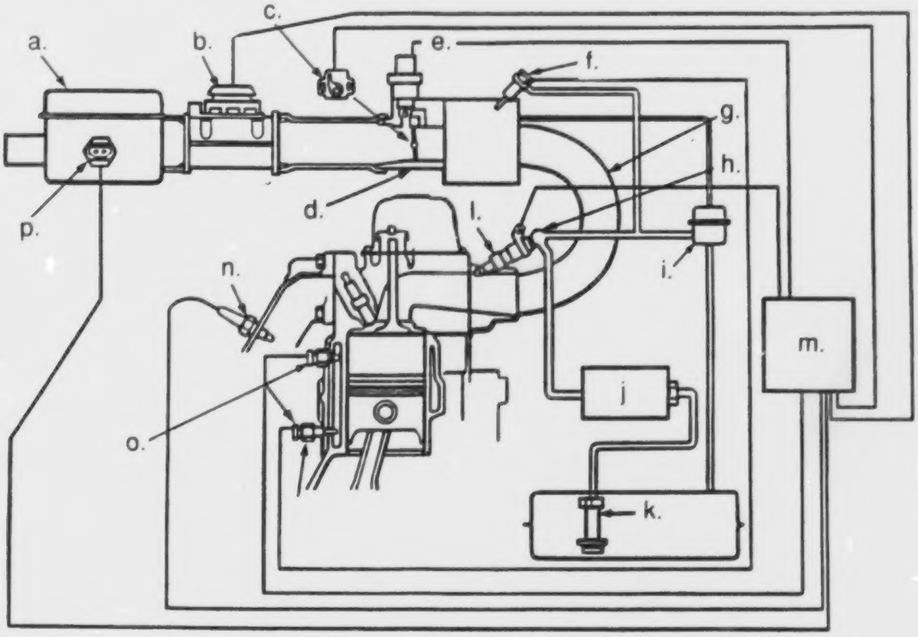
a. ______________________ d. ______________________

b. ______________________ e. ______________________

c. ______________________ f. ______________________

Written Test

4. Identify the components of a typical fuel injected fuel system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



Courtesy of AC Delco/General Motors Corporation

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

i. ______________________________

j. ______________________________

k. ______________________________

l. ______________________________

m. ______________________________

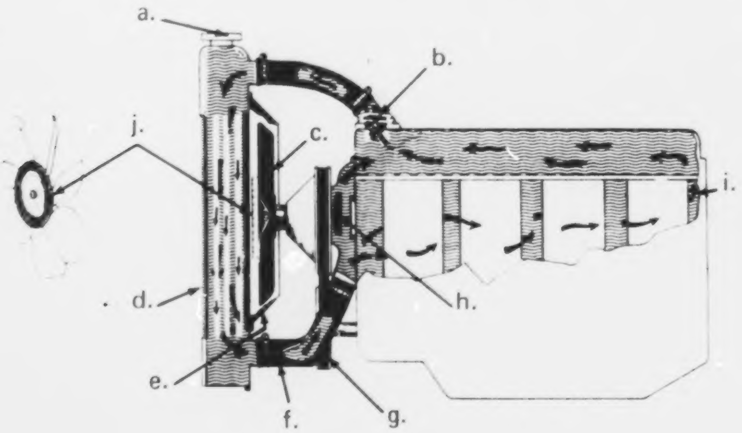
n. ______________________________

o. ______________________________

p. ______________________________

Written Test

5. Identify the components of a typical cooling system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

g. ______________________

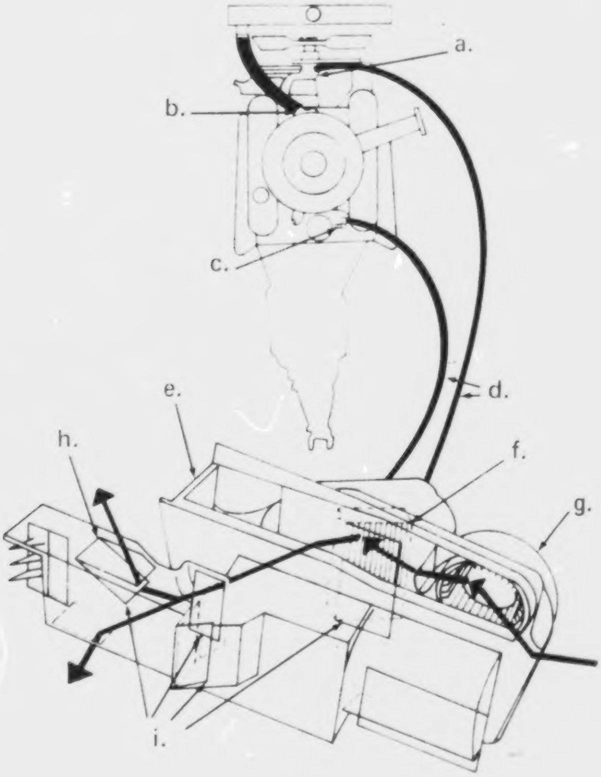
h. ______________________

i. ______________________

j. ______________________

Written Test

6. Identify the components of a typical heating system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

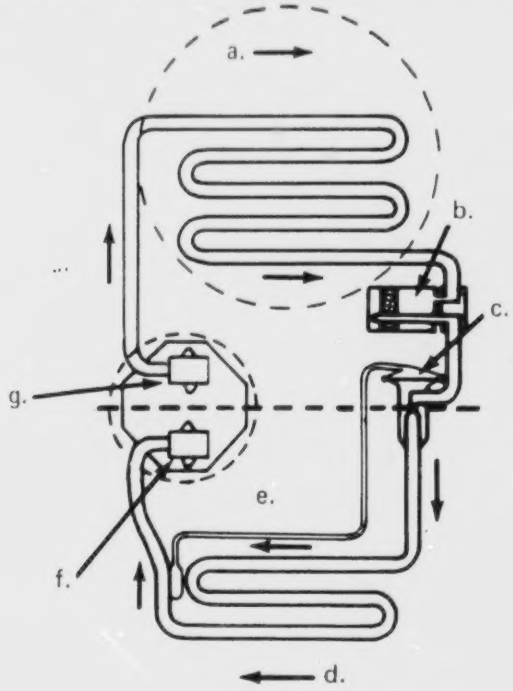
g. ______________________

h. ______________________

i. ______________________

Written Test

7. Identify the components of a typical air-conditioning system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________ e. ______________________

b. ______________________ f. ______________________

c. ______________________ g. ______________________

d. ______________________

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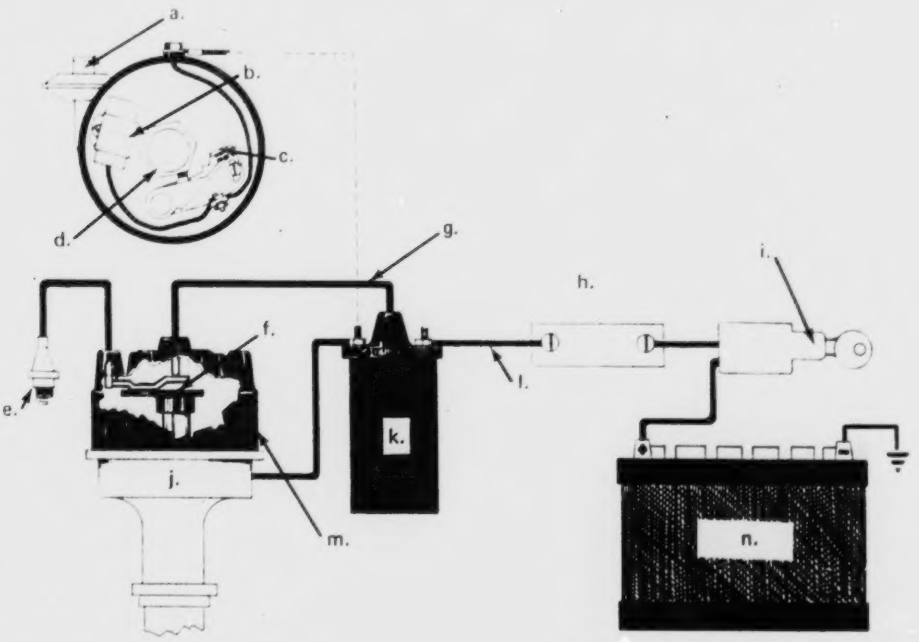
Written Test

8. Identify the components of a typical conventional ignition system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

g. ______________________

h. ______________________

i. ______________________

j. ______________________

k. ______________________

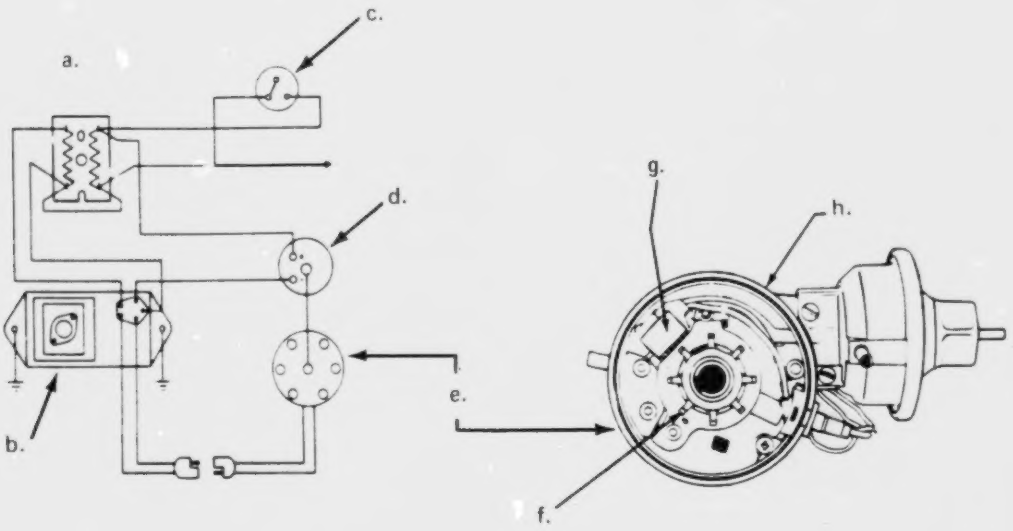
l. ______________________

m. ______________________

n. ______________________

Written Test

9. Identify the components of a typical electronic ignition system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

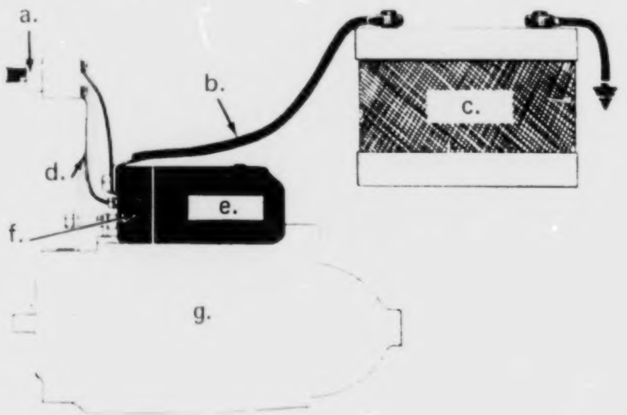
f. ______________________

g. ______________________

h. ______________________

Written Test

10. Identify the components of a typical starting system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



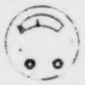
a. ____________________ e. ____________________

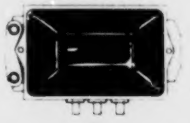
b. ____________________ f. ____________________

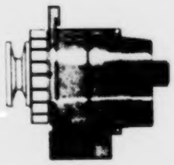
c. ____________________ g. ____________________

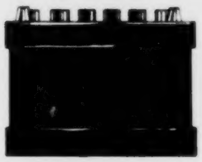
d. ____________________

11. Identify the components of a typical charging system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.


a.


b.


c.

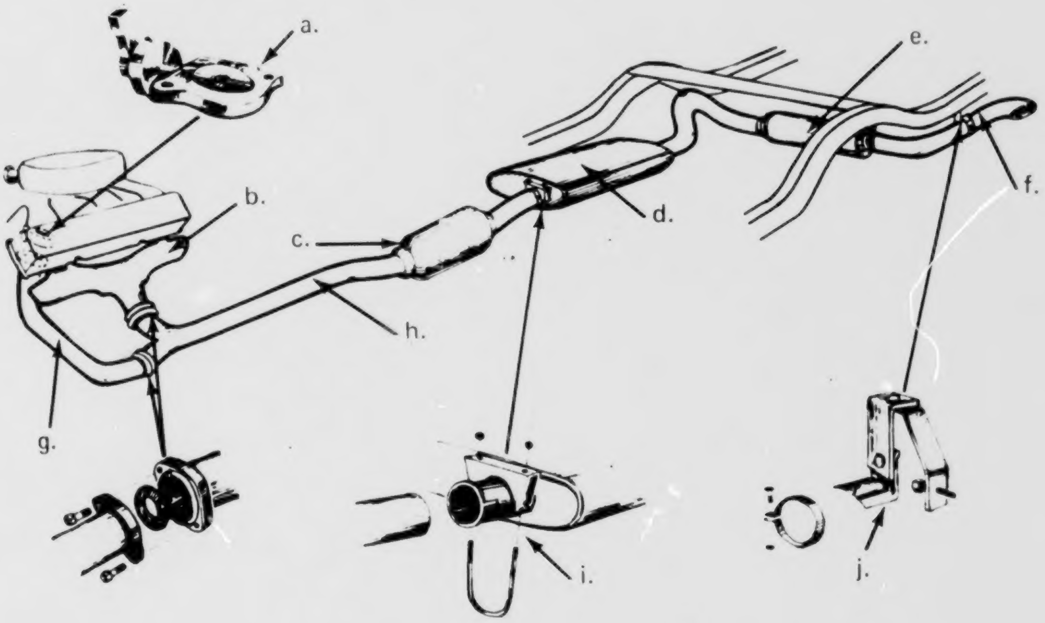

d.

a. ____________________ c. ____________________

b. ____________________ d. ____________________

Written Test

12. Identify the components of a typical exhaust system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

g. ______________________________

h. ______________________________

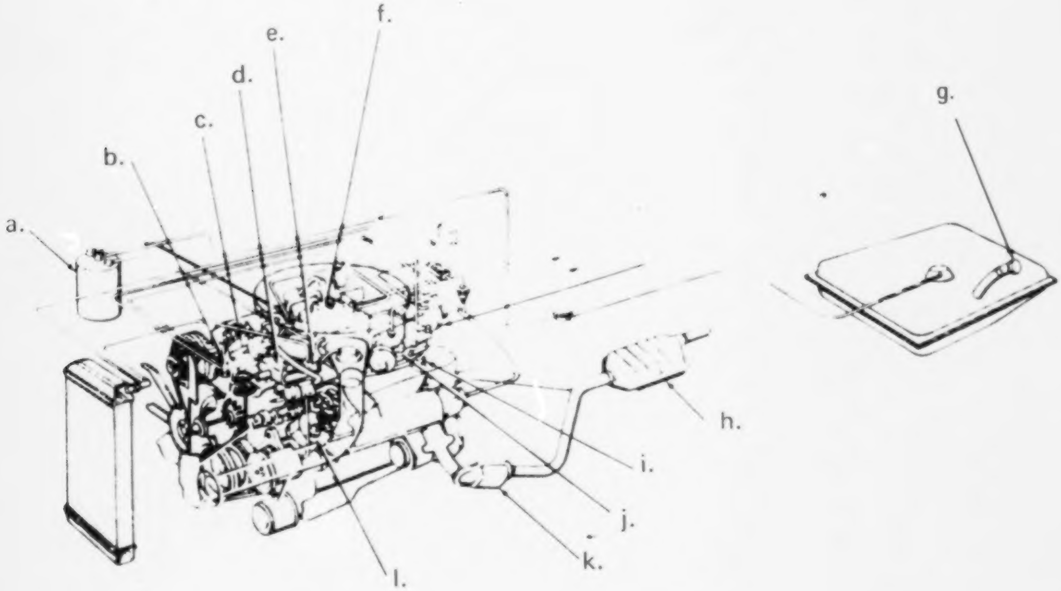
i. ______________________________

j. ______________________________

406

Written Test

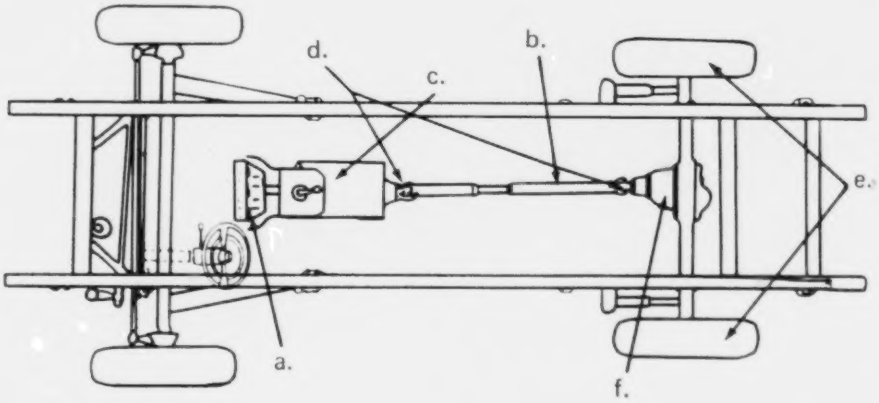
13. Identify the components of a typical emission control system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a.	____________________	g.	____________________
b.	____________________	h.	____________________
c.	____________________	i.	____________________
d.	____________________	j.	____________________
e.	____________________	k.	____________________
f.	____________________	l.	____________________

Written Test

14. Identify the components of a two-wheel drive train. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________________ d. ______________________________

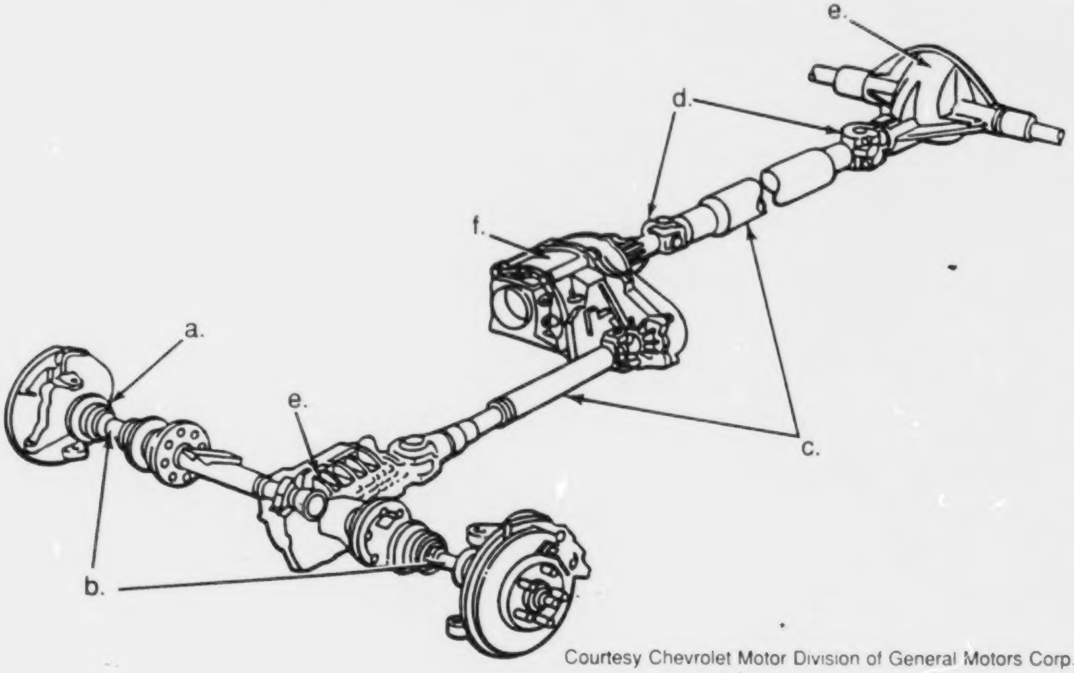
b. ______________________________ e. ______________________________

c. ______________________________ f. ______________________________

408

Written Test

15. Identify the components of a four-wheel drive train. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



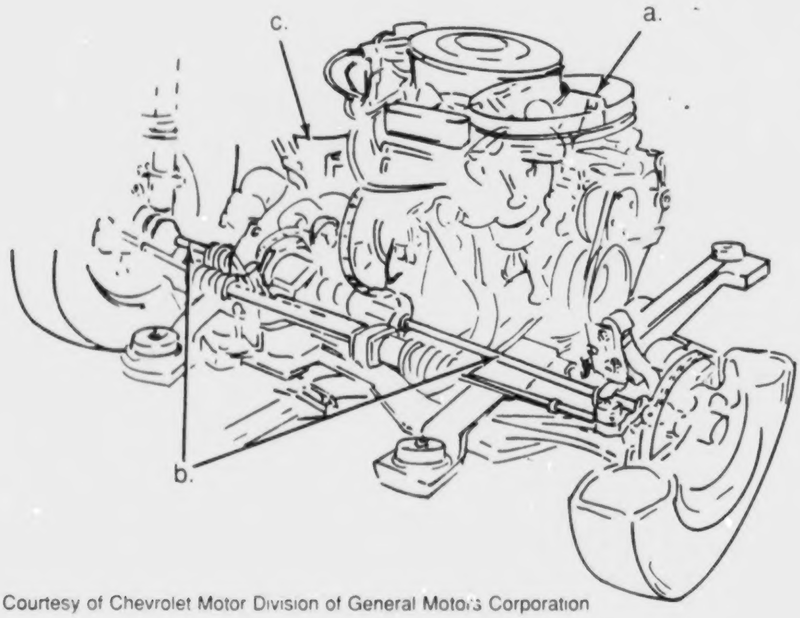
Courtesy Chevrolet Motor Division of General Motors Corp.

a.	______________________	d.	______________________
b.	______________________	e.	______________________
c.	______________________	f.	______________________

403

Written Test

16. Identify the components of a front-wheel drive train. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



Courtesy of Chevrolet Motor Division of General Motors Corporation

a. ______________________

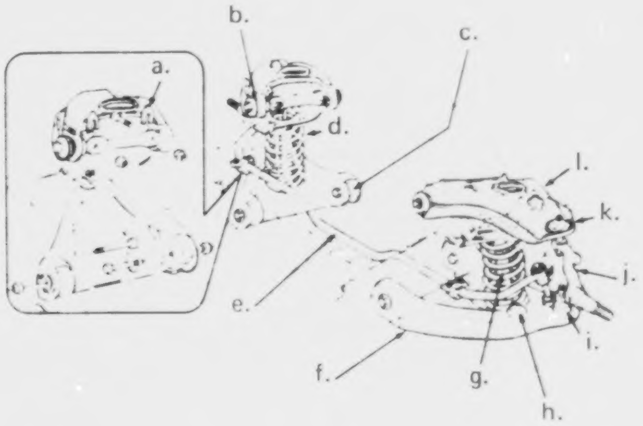
b. ______________________

c. ______________________

410

Written Test

17. Identify the components of a typical rear-wheel drive front suspension system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

g. ______________________

h. ______________________

i. ______________________

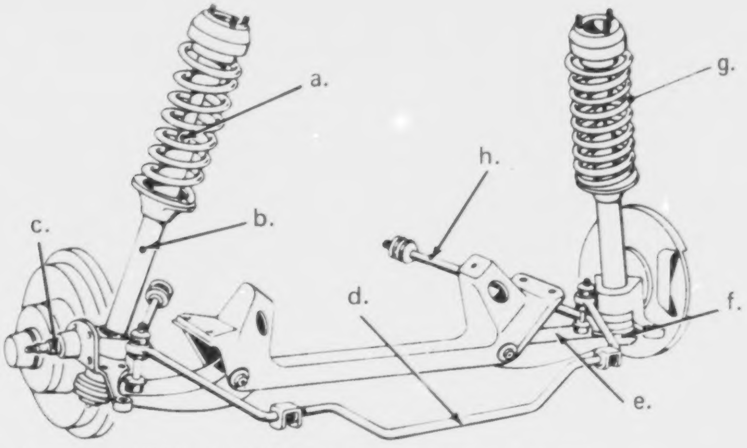
j. ______________________

k. ______________________

l. ______________________

Written Test

18. Identify the components of a McPherson strut suspension system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



Courtesy of MOOG AUTOMOTIVE INC., St. Louis, Missouri

a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

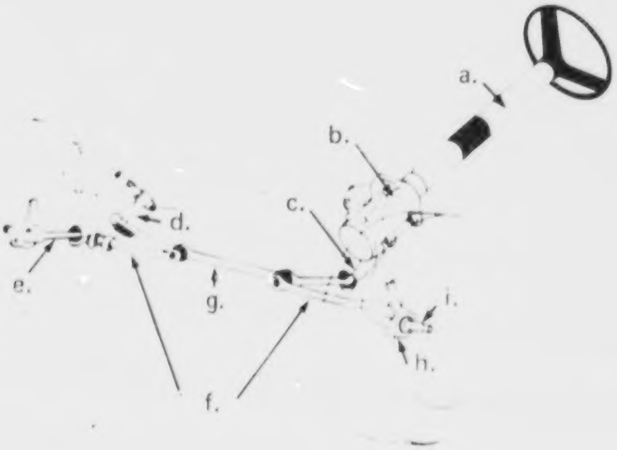
g. ______________________

h. ______________________

412

Written Test

19. Identify the components of a conventional steering system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

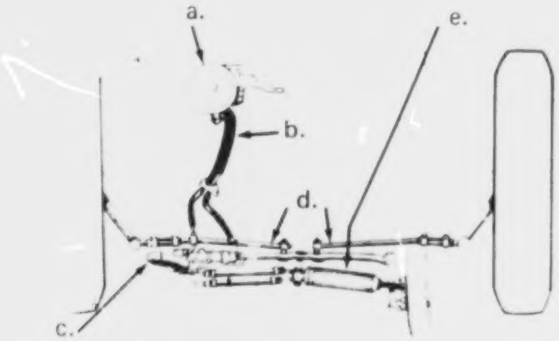
g. ______________________

h. ______________________

i. ______________________

Written Test

20. Identify the components of a power steering system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



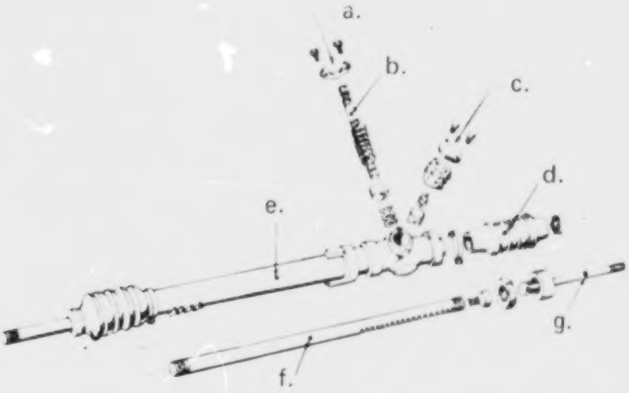
a. ______________________________ d. ______________________________

b. ______________________________ e. ______________________________

c. ______________________________

Written Test

21. Identify the components of a rack-and-pinion power steering system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



Courtesy of MOOG AUTOMOTIVE INC., St. Louis, Missouri

a. ______________________

b. ______________________

c. ______________________

d. ______________________

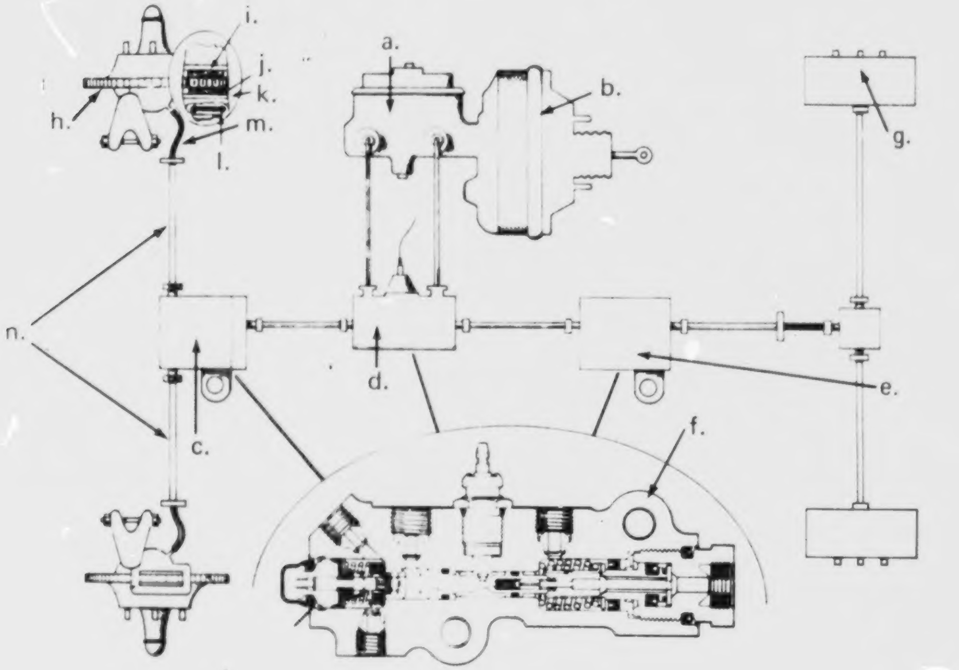
e. ______________________

f. ______________________

g. ______________________

Written Test

22. Identify the components of a disc brake system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

k. ____________________

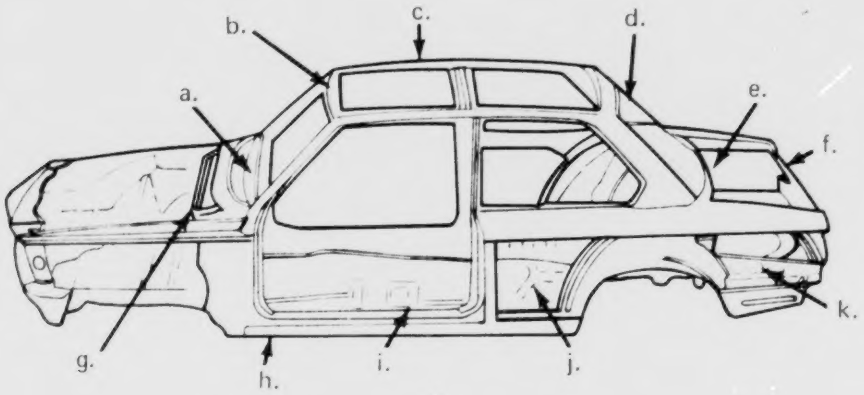
l. ____________________

m. ____________________

n. ____________________

Written Test

23. Identify the components of a body system. Write the name of the part in the blanks corresponding to the lettered blanks on the illustration.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

h. ____________________

i. ____________________

j. ____________________

k. ____________________

***Permission to duplicate this test is granted.**

Automotive Parts and Systems Identification
Unit 6

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Analyze Scenarios to Determine Correct Motor Oil Selection Rating ______

Comments: ______________________________

____

Assignment Sheet 2—Analyze Scenarios to Determine Possible Engine Problems Rating ______

Comments: ______________________________

____

Assignment Sheet 3—Analyze Scenarios to Determine Possible Cooling/Heating System Problems Rating ______

Comments: ______________________________

____

Assignment Sheet 4—Analyze Scenarios to Determine Exhaust System Problems Rating ______

Comments: ______________________________

____

Assignment Sheet 5—Analyze Scenarios to Determine Battery and Charging System Problems Rating ______

Comments: ______________________________

____

Assignment Sheet 6—Answer Questions Related to Brake Systems Rating ______

Comments: ______________________________

____

Unit Evaluation Form

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

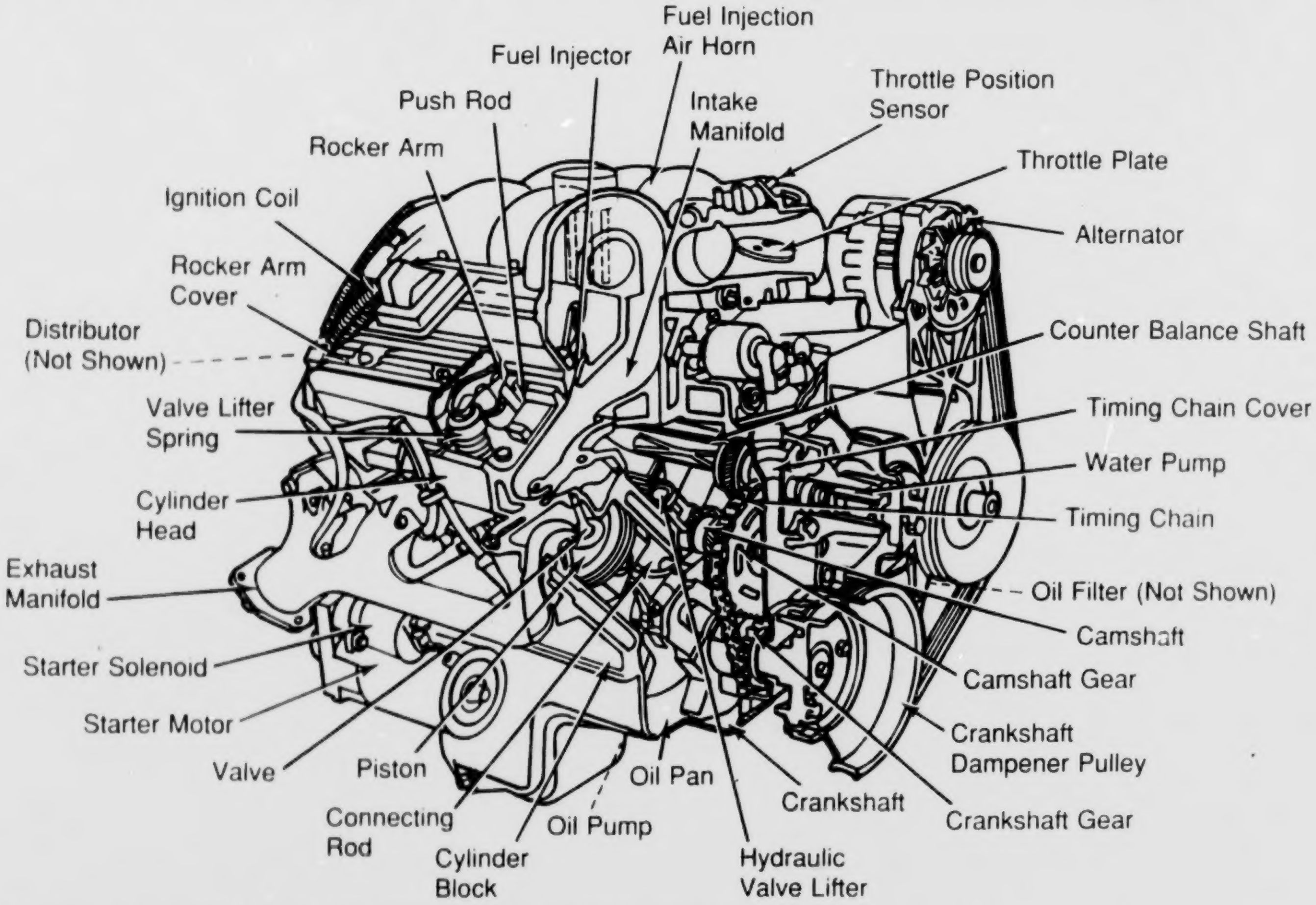
____

Teacher Signature ______________________ Date __________

Student Signature ______________________ Date __________

*Permission to duplicate this form is granted.

Basic Components of an Automobile Engine

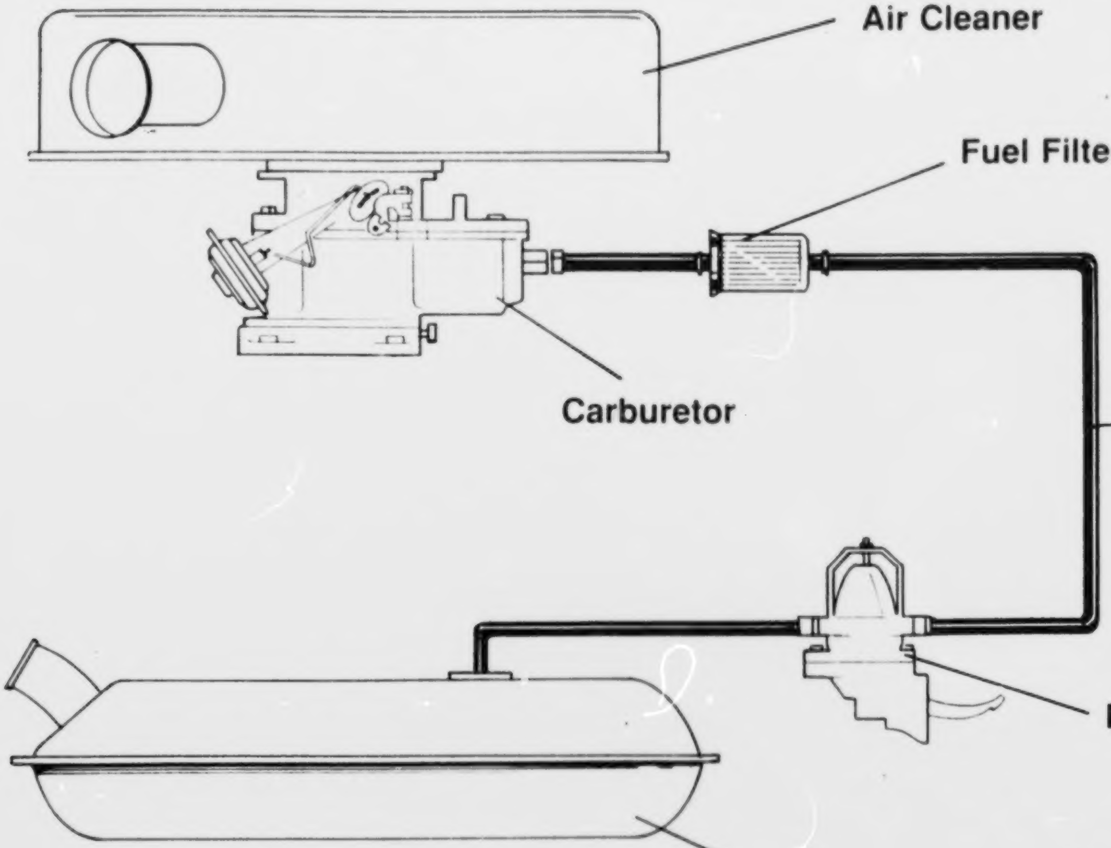

Fuel Injection Air Horn
Fuel Injector
Push Rod
Intake Manifold
Throttle Position Sensor
Rocker Arm
Throttle Plate
Ignition Coil
Alternator
Rocker Arm Cover
Distributor (Not Shown)
Counter Balance Shaft
Valve Lifter Spring
Timing Chain Cover
Water Pump
Cylinder Head
Timing Chain
Exhaust Manifold
Oil Filter (Not Shown)
Camshaft
Starter Solenoid
Camshaft Gear
Starter Motor
Crankshaft Dampener Pulley
Valve
Piston
Oil Pan
Crankshaft
Crankshaft Gear
Connecting Rod
Oil Pump
Cylinder Block
Hydraulic Valve Lifter

Courtesy of General Motors Corporation, Service Technology Group

Parts Specialist: Unit 6
Teacher Page 41

TM 1

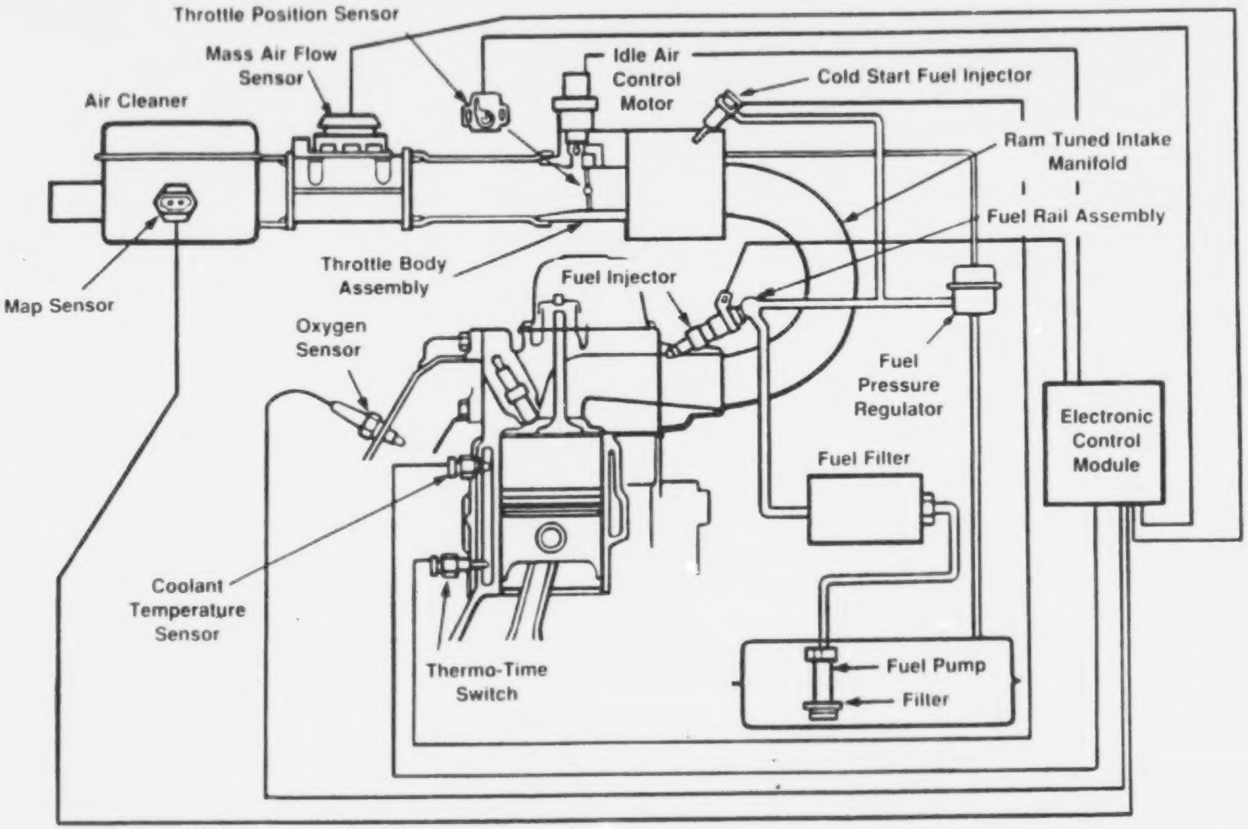
Basic Components of a Carbureted Fuel System


Air Cleaner
Fuel Filter
Carburetor
Fuel Line
Fuel Pump
Fuel Tank

Note: Many manufacturers now use electric fuel pumps inside or outside the fuel tank.

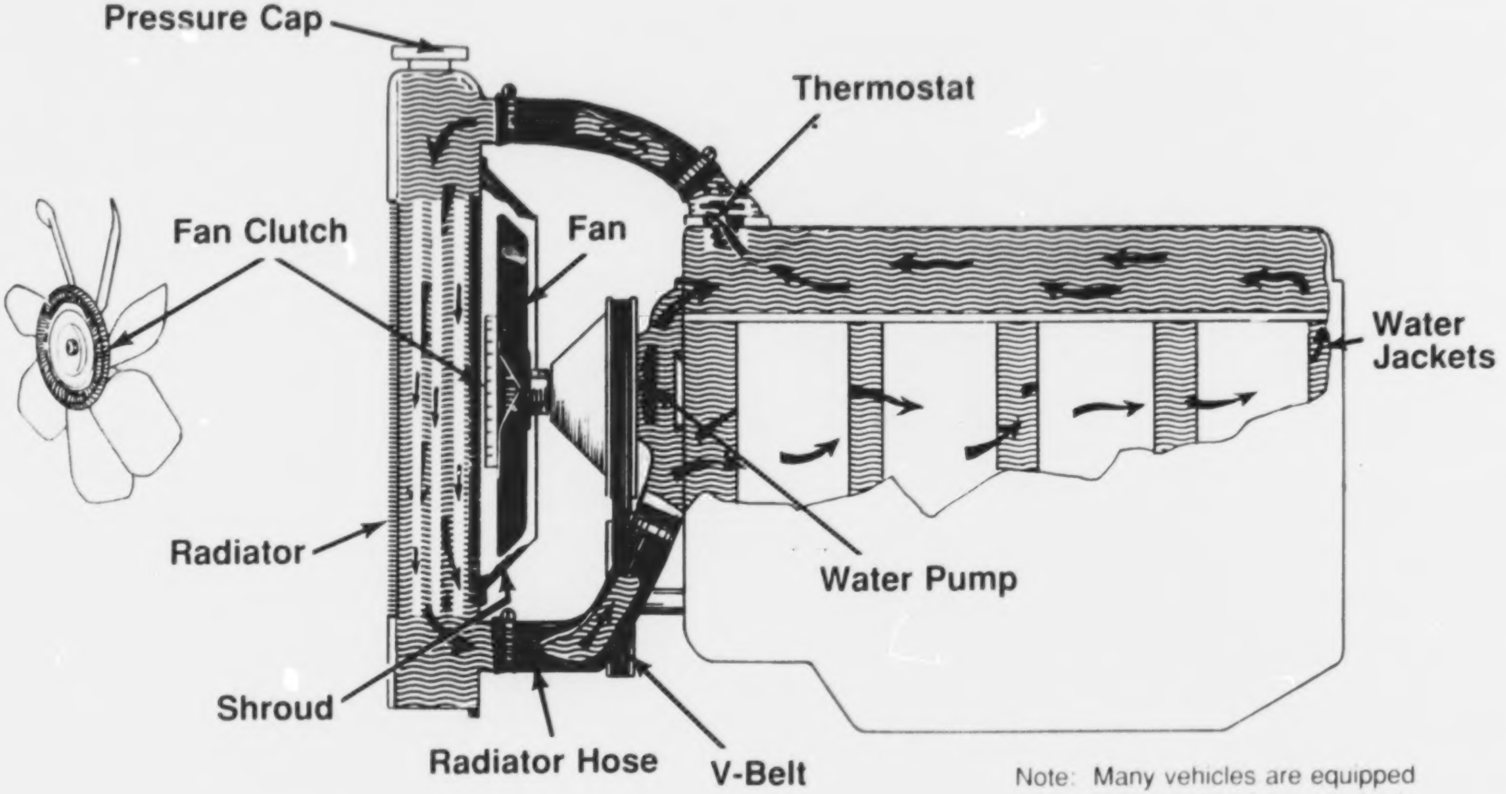
Parts Specialist, Unit 6
Teacher Page 43

Basic Components of a Fuel-Injected Fuel System


Throttle Position Sensor
Mass Air Flow Sensor
Air Cleaner
Idle Air Control Motor
Cold Start Fuel Injector
Ram Tuned Intake Manifold
Fuel Rail Assembly
Throttle Body Assembly
Map Sensor
Fuel Injector
Oxygen Sensor
Fuel Pressure Regulator
Electronic Control Module
Fuel Filter
Coolant Temperature Sensor
Thermo-Time Switch
Fuel Pump
Filter

Courtesy of AC Delco/General Motors Corporation

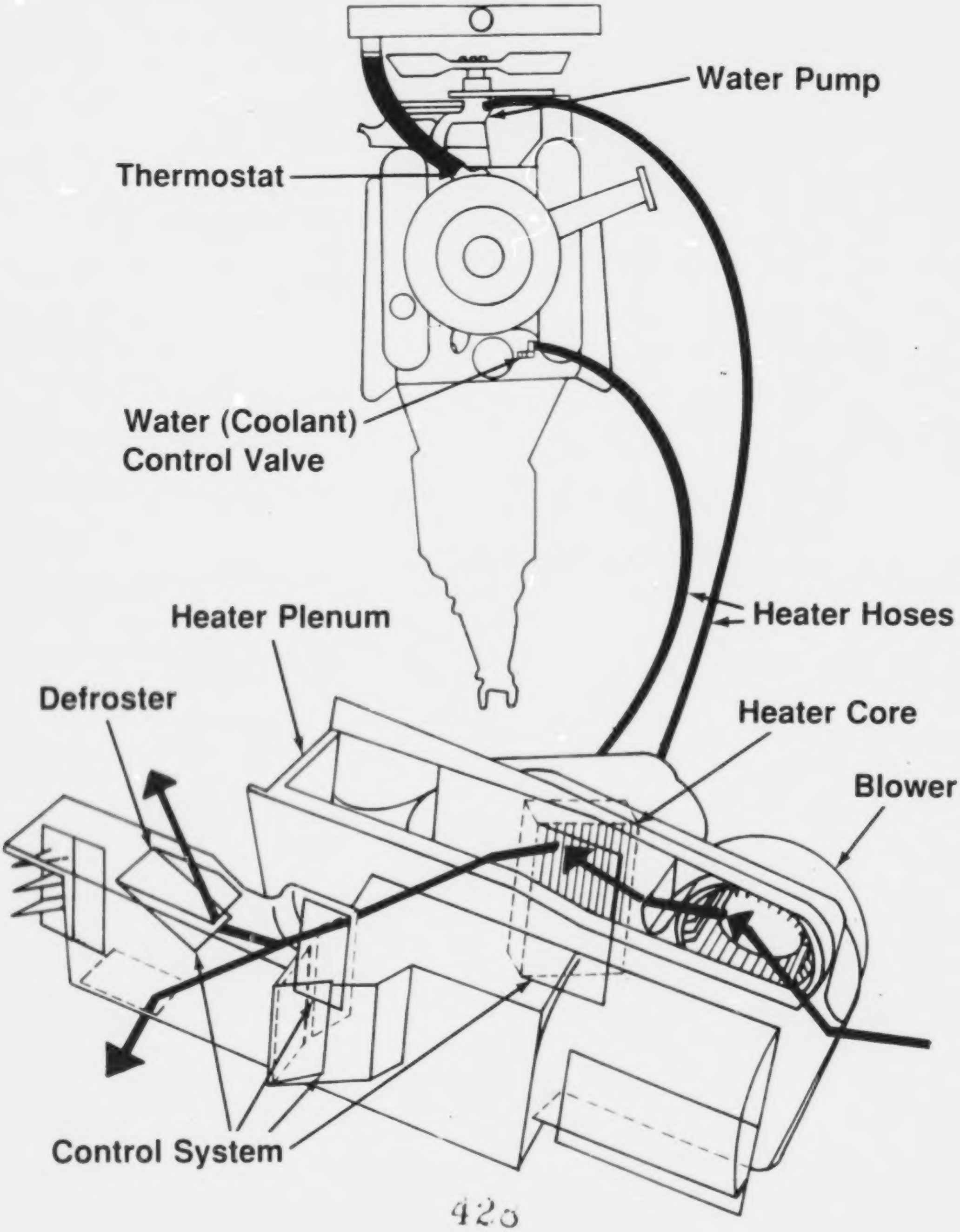
Basic Components of a Cooling System


Pressure Cap
Thermostat
Fan Clutch
Fan
Water Jackets
Radiator
Water Pump
Shroud
Radiator Hose
V-Belt

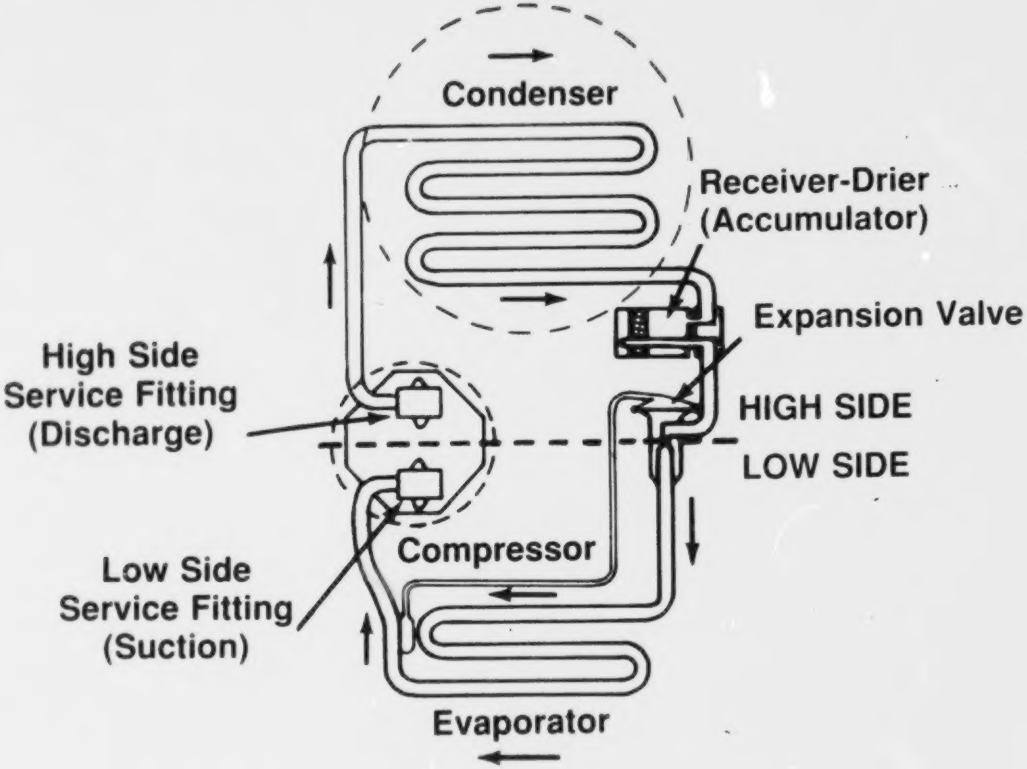
Note: Many vehicles are equipped with electric cooling fans attached to back of radiator.

Note: Many vehicles are equipped with electric cooling fans attached to back of radiator.

Basic Components of a Heating System


Water Pump
Thermostat
Water (Coolant) Control Valve
Heater Hoses
Heater Plenum
Defroster
Heater Core
Blower
Control System

Basic Components of an Air Conditioning System



Condenser

Receiver-Drier
(Accumulator)

Expansion Valve

HIGH SIDE

LOW SIDE

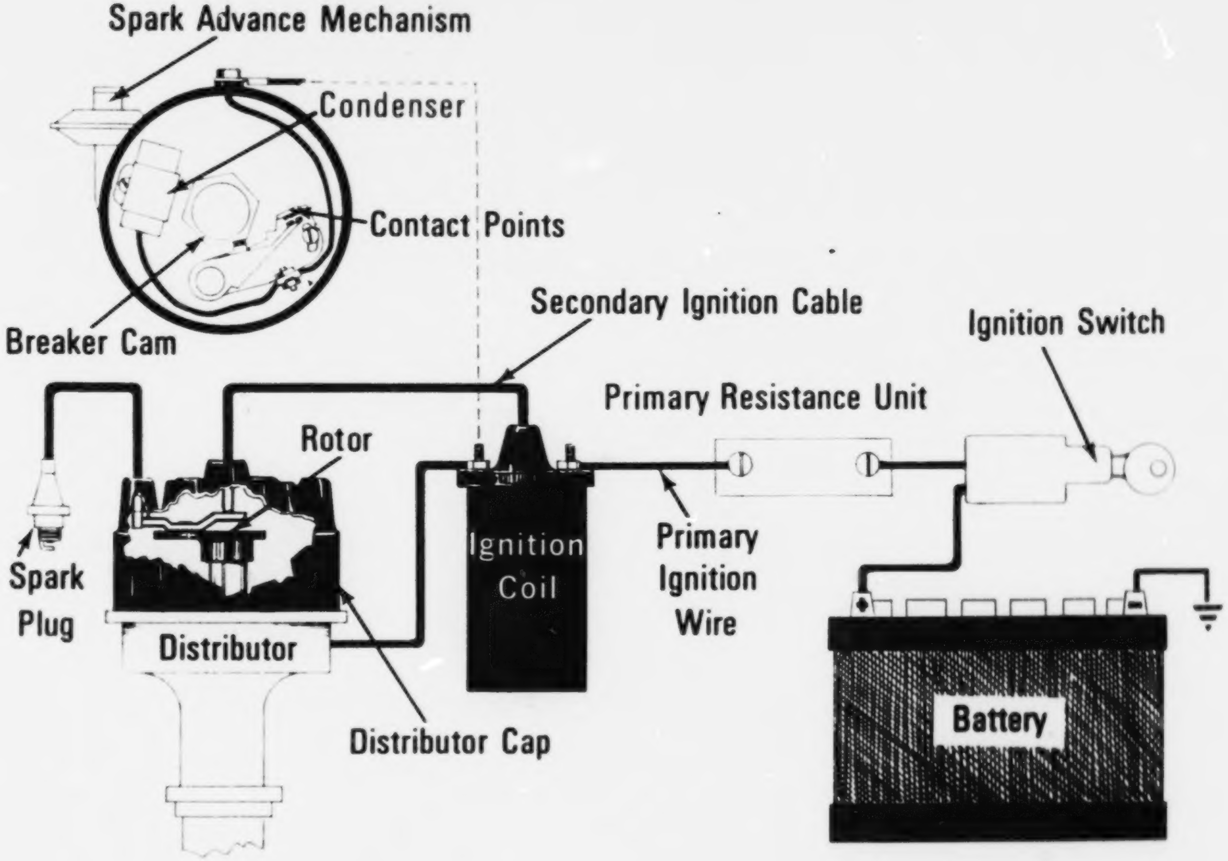
High Side
Service Fitting
(Discharge)

Compressor

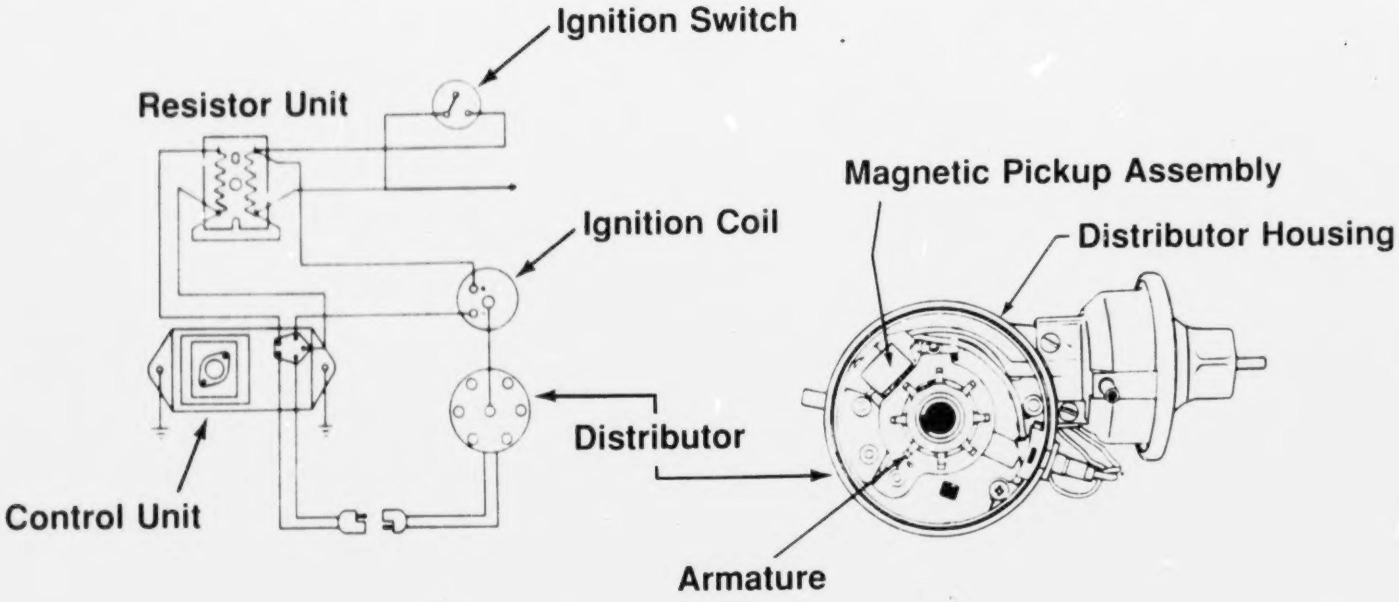
Low Side
Service Fitting
(Suction)

Evaporator

Basic Components of a Conventional Ignition System

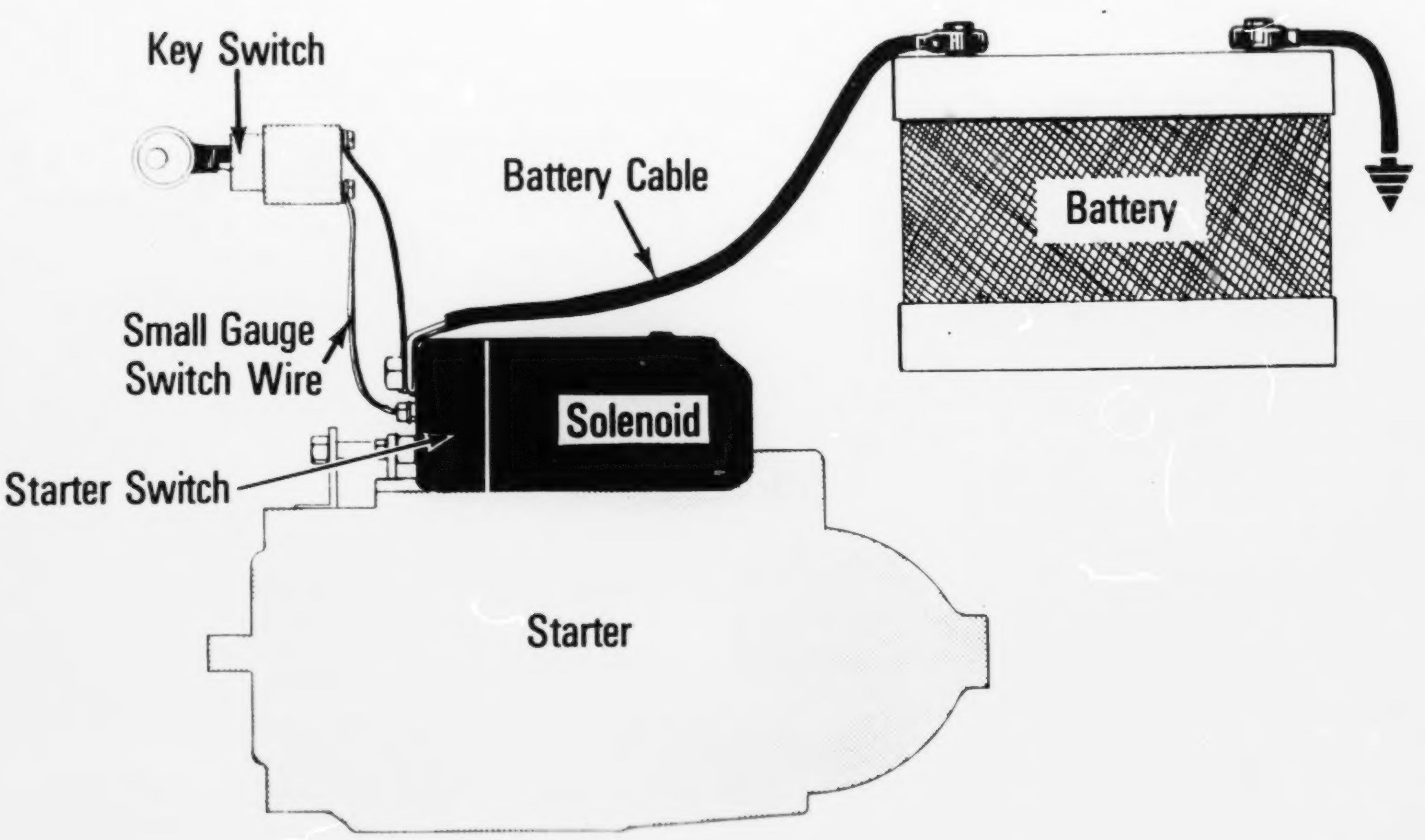

Spark Advance Mechanism
Condenser
Contact Points
Breaker Cam
Secondary Ignition Cable
Ignition Switch
Primary Resistance Unit
Rotor
Ignition Coil
Primary Ignition Wire
Spark Plug
Distributor
Distributor Cap
Battery

Basic Components of an Electronic Ignition System


Ignition Switch
Resistor Unit
Magnetic Pickup Assembly
Ignition Coil
Distributor Housing
Distributor
Control Unit
Armature

Note: Some manufacturers use "distributorless" ignition with a pickup coil located on the crankshaft to signal proper position for timing ignition pulses.

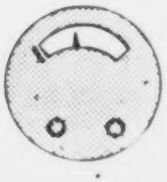
Basic Components of a Starting System


Key Switch
Battery Cable
Battery
Small Gauge Switch Wire
Solenoid
Starter Switch
Starter

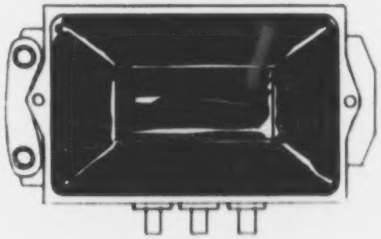
Parts Specialist Unit 6
Teacher Page 57

TM 9

Basic Components of a Charging System

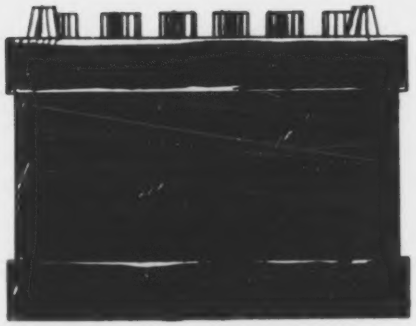


Ammeter

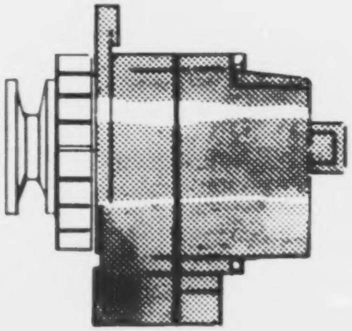


Regulator

Note: Indicator light replaces ammeter on some models.



Battery



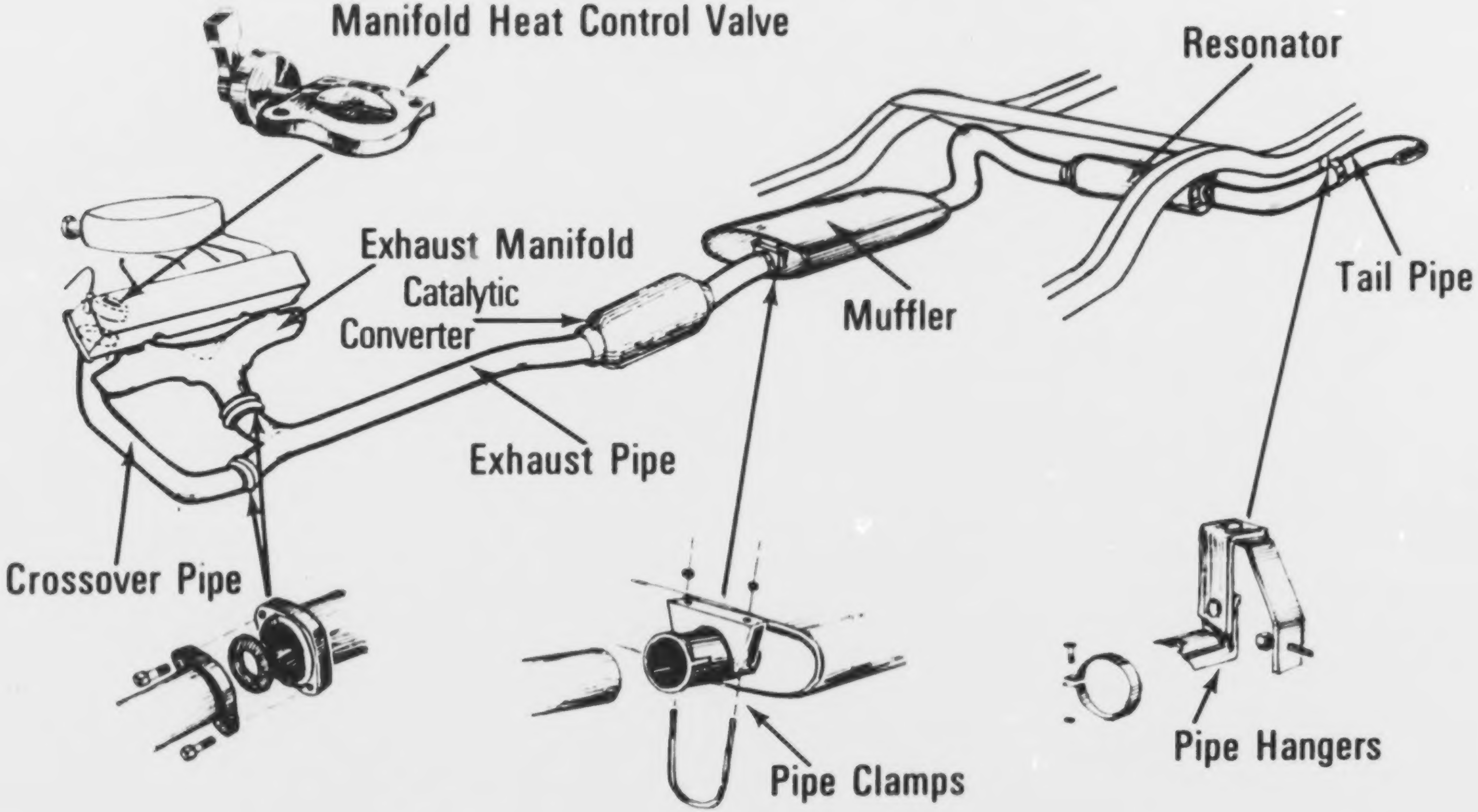
Alternator

Note: Most alternators have the regulator built in.

Parts Specialist Unit 6
Teacher Page 59

TM 10

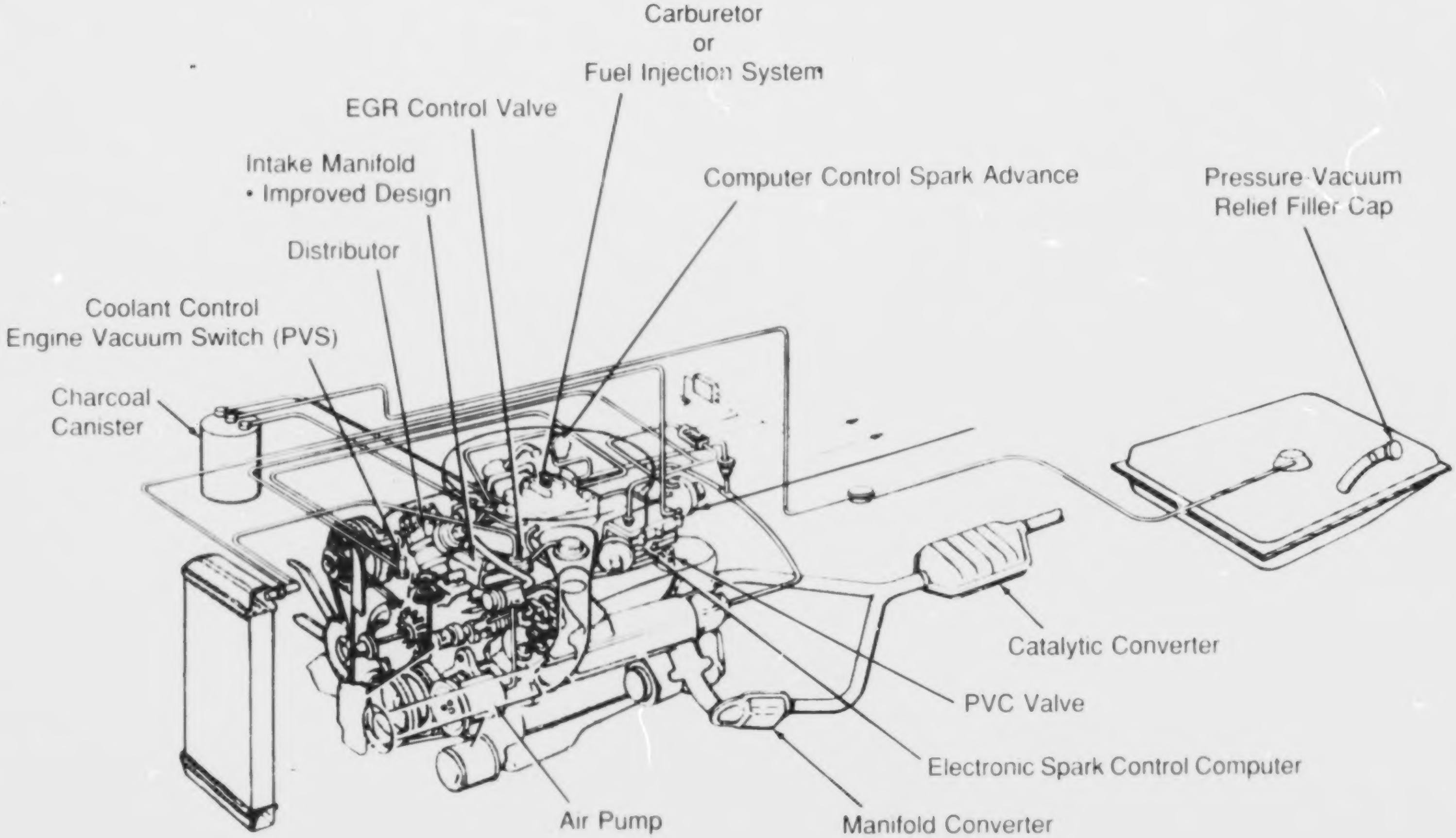
Basic Components of an Exhaust System


Manifold Heat Control Valve
Resonator
Exhaust Manifold
Catalytic Converter
Muffler
Tail Pipe
Exhaust Pipe
Crossover Pipe
Pipe Clamps
Pipe Hangers

Parts Specialist, Unit 6
Teacher Page 61

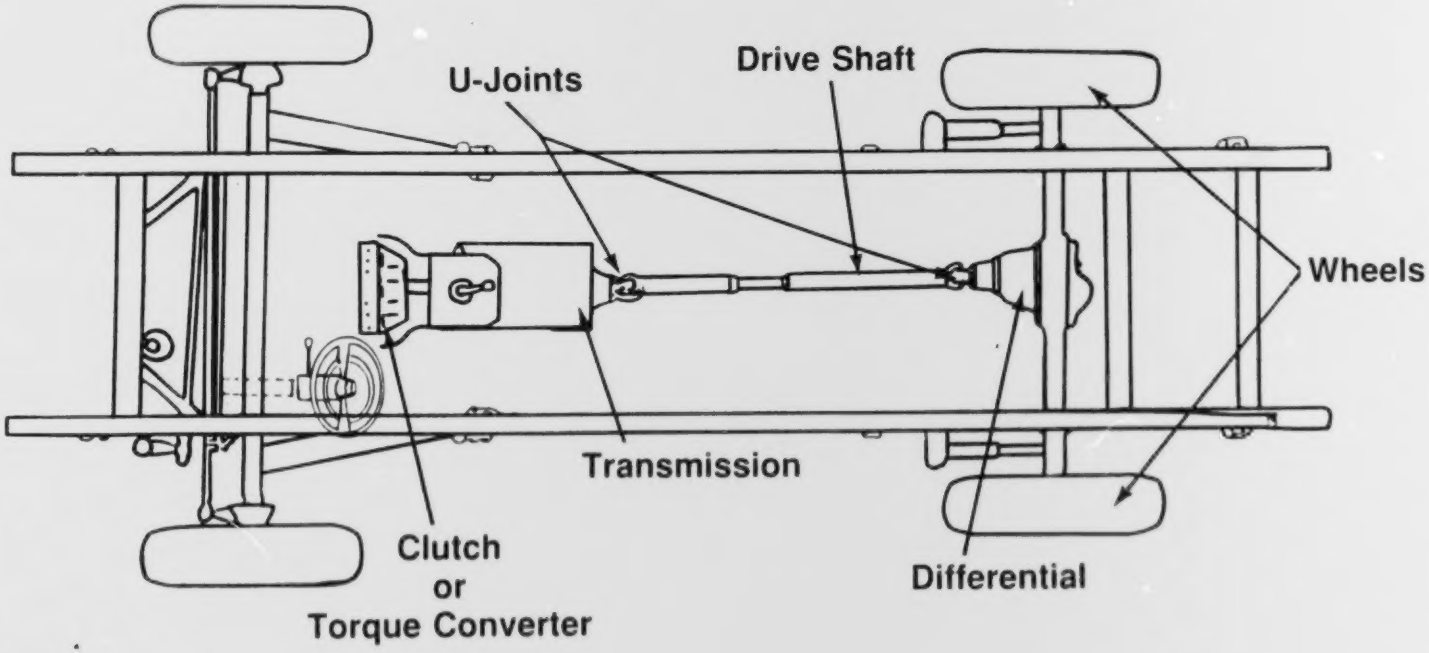
TM 11

Basic Components of an Emission Control System


Carburetor
or
Fuel Injection System
EGR Control Valve
Intake Manifold
• Improved Design
Computer Control Spark Advance
Pressure-Vacuum
Relief Filler Cap
Distributor
Coolant Control
Engine Vacuum Switch (PVS)
Charcoal
Canister
Catalytic Converter
PVC Valve
Electronic Spark Control Computer
Air Pump
Manifold Converter

Parts Specialist Unit 6
Teacher Page 63

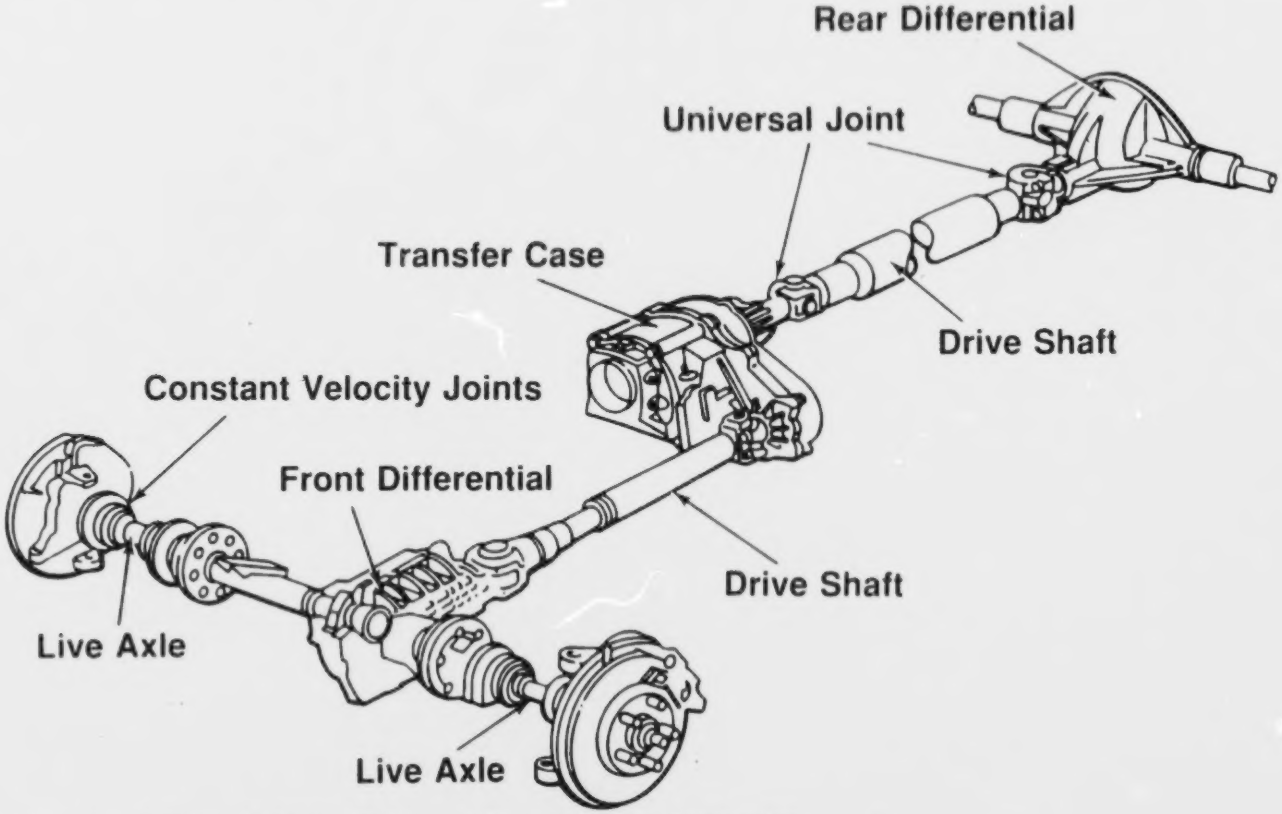
Basic Components of a Conventional Two-Wheel Drive Train


U-Joints
Drive Shaft
Wheels
Transmission
Clutch or Torque Converter
Differential

Parts Specialist, Unit 6
Teacher Page 65

TM 13

Basic Components of a Typical Four-Wheel Drive Train

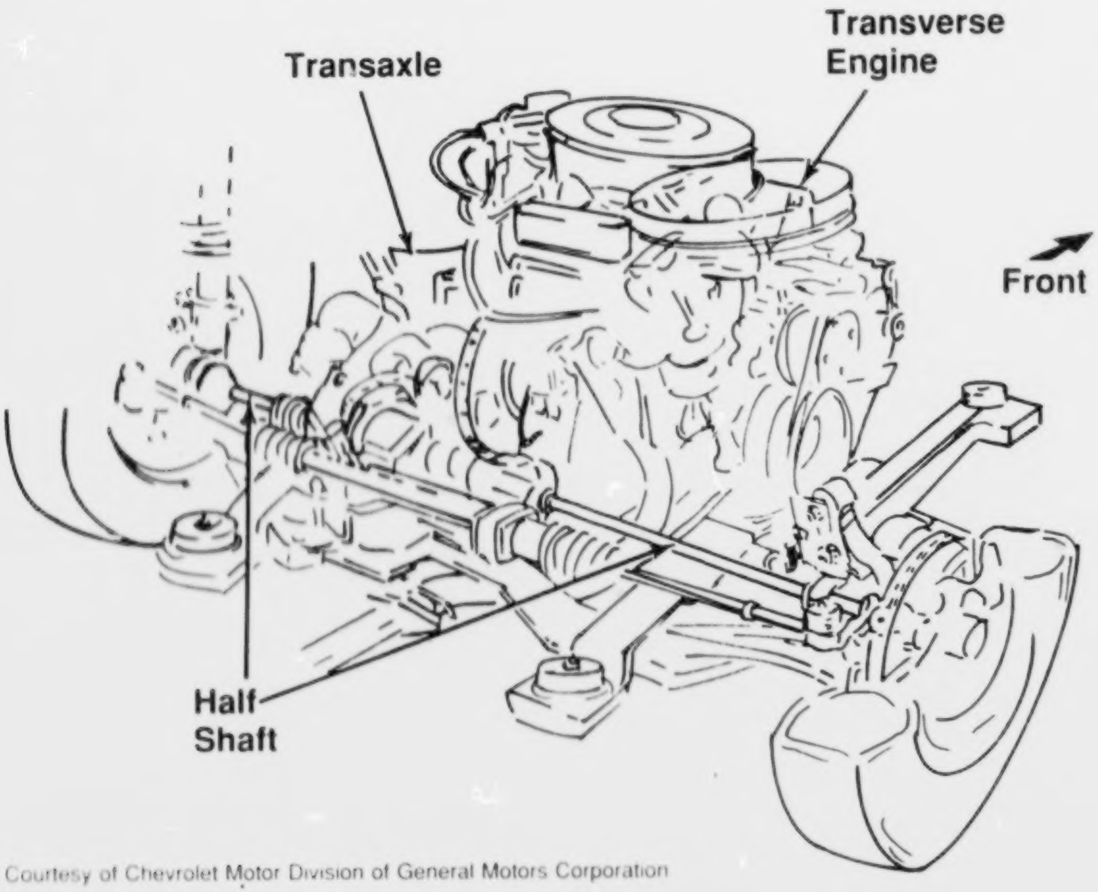

Rear Differential
Universal Joint
Transfer Case
Drive Shaft
Constant Velocity Joints
Front Differential
Drive Shaft
Live Axle
Live Axle

Courtesy of Chevrolet Motor Division of General Motors Corporation

Parts Specialist Unit 6
Teacher Page 67

TM 14

Components of Front-Wheel Drive Train

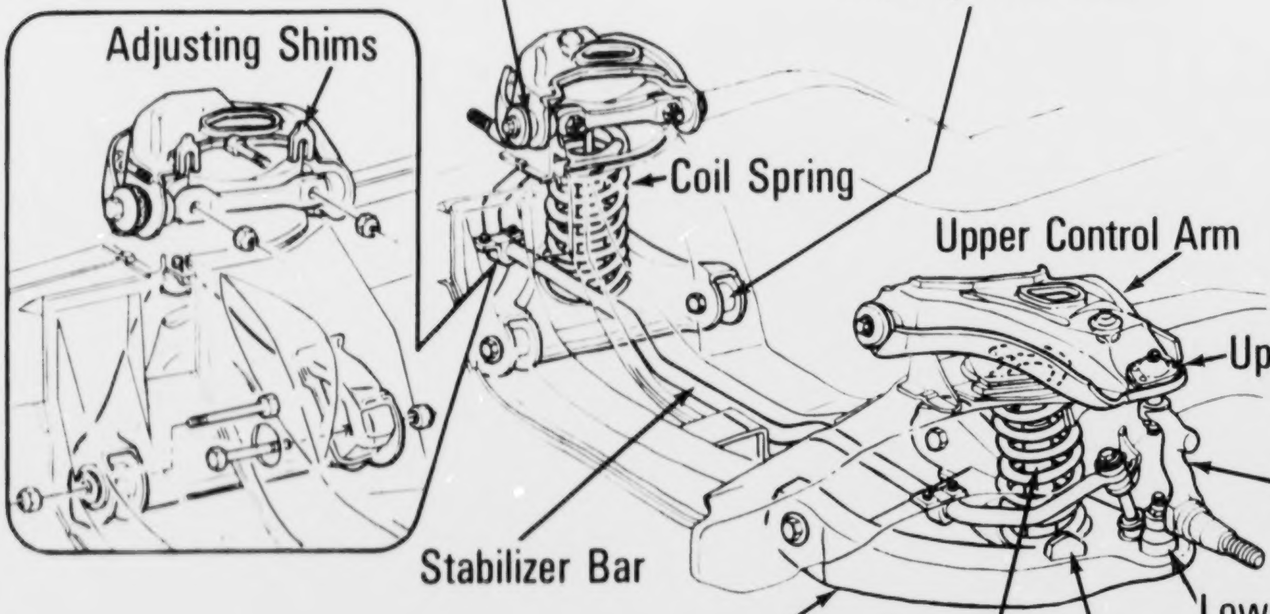

Transaxle
Transverse Engine
Front
Half Shaft

Courtesy of Chevrolet Motor Division of General Motors Corporation

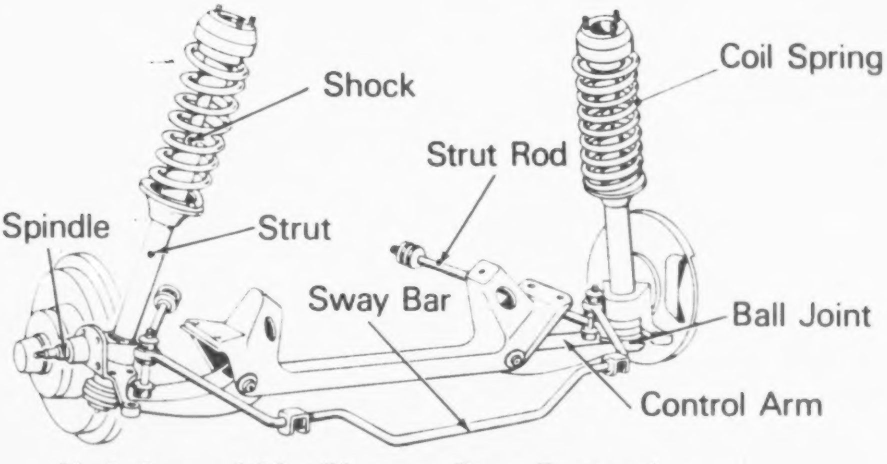
Parts Specialist, Unit 6
Teacher Page 69

TM 15

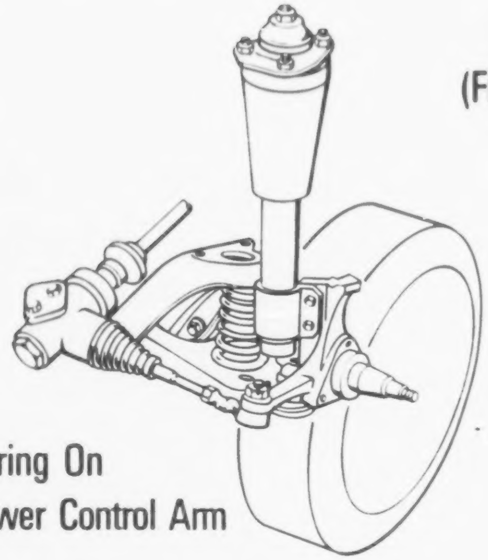
Basic Components of a Rear-Wheel Drive Front Suspension System


Upper Control Arm Inner Bushings
Lower Control Arm Inner Bushings and Shaft
Adjusting Shims
Coil Spring
Upper Control Arm
Upper Ball Joint
Steering Knuckle
Stabilizer Bar
Lower Ball Joint
Lower Control Arm
Shock Absorber
Rubber Bumper

Basic Components of a MacPheson Strut Suspension System

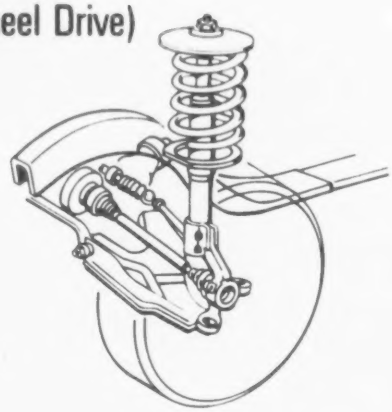

Shock
Coil Spring
Strut Rod
Spindle
Strut
Sway Bar
Ball Joint
Control Arm

Variations of MacPherson Strut Suspension



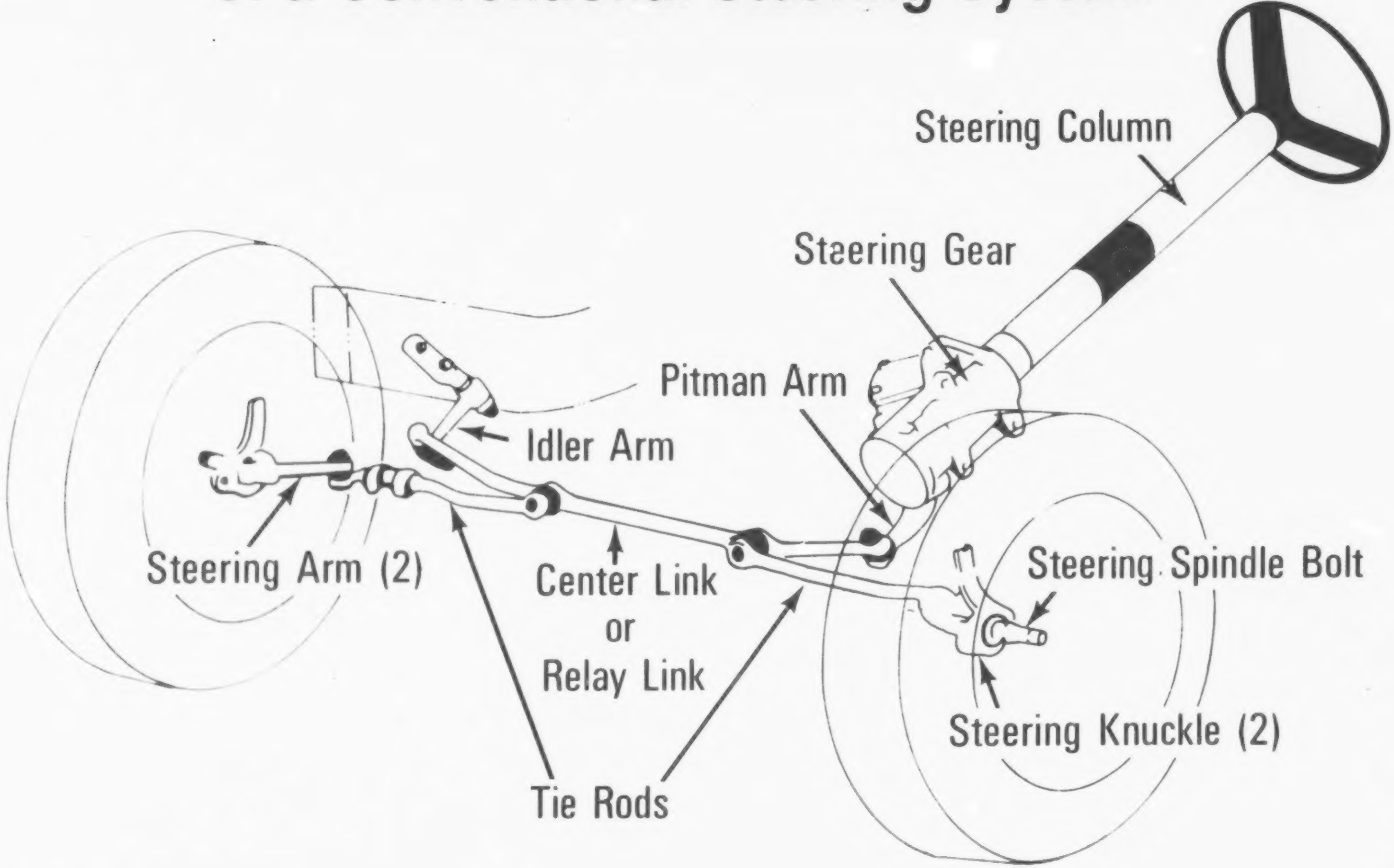
Spring On
Lower Control Arm

Coil Spring
Around Strut
(Front Wheel Drive)



Courtesy of MOOG AUTOMOTIVE INC., St. Louis, Missouri

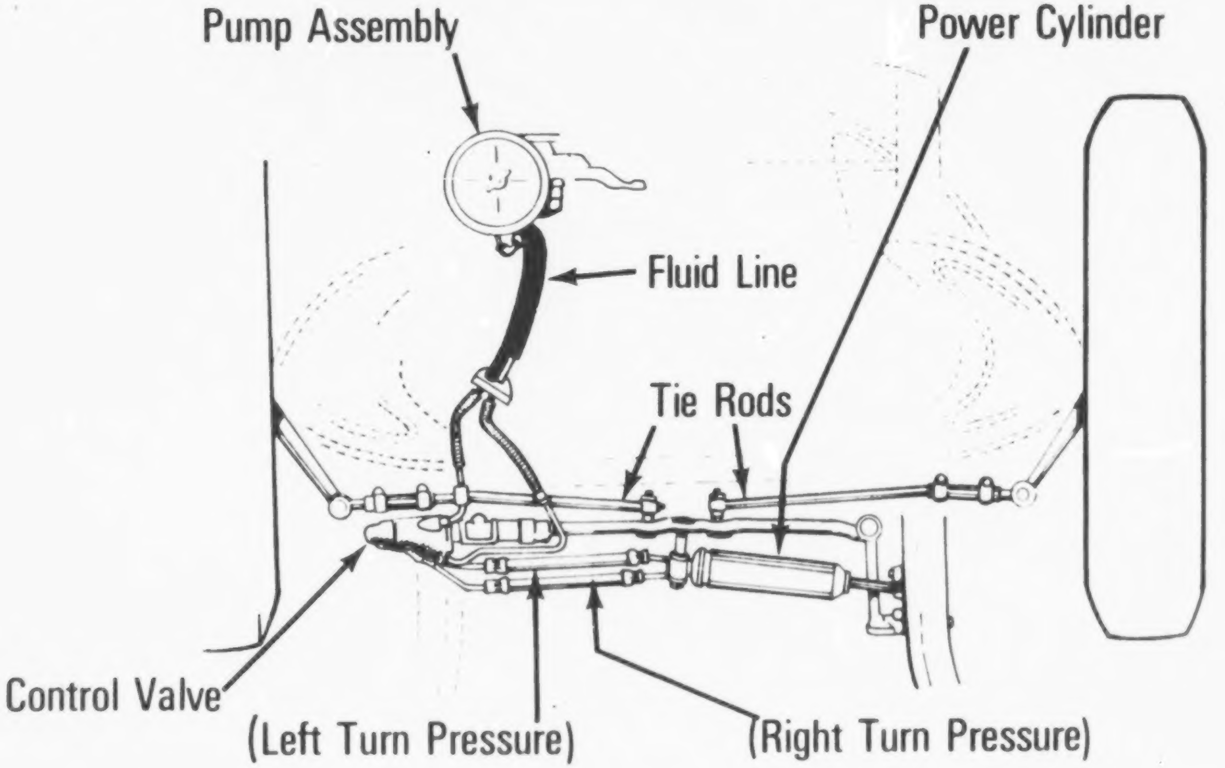
Basic Components of a Conventional Steering System


Steering Column
Steering Gear
Pitman Arm
Idler Arm
Steering Arm (2)
Center Link
or
Relay Link
Steering Spindle Bolt
Steering Knuckle (2)
Tie Rods

Parts Specialist: Unit 6
Teacher Page 75

TM 18

Basic Components of a Power Steering System

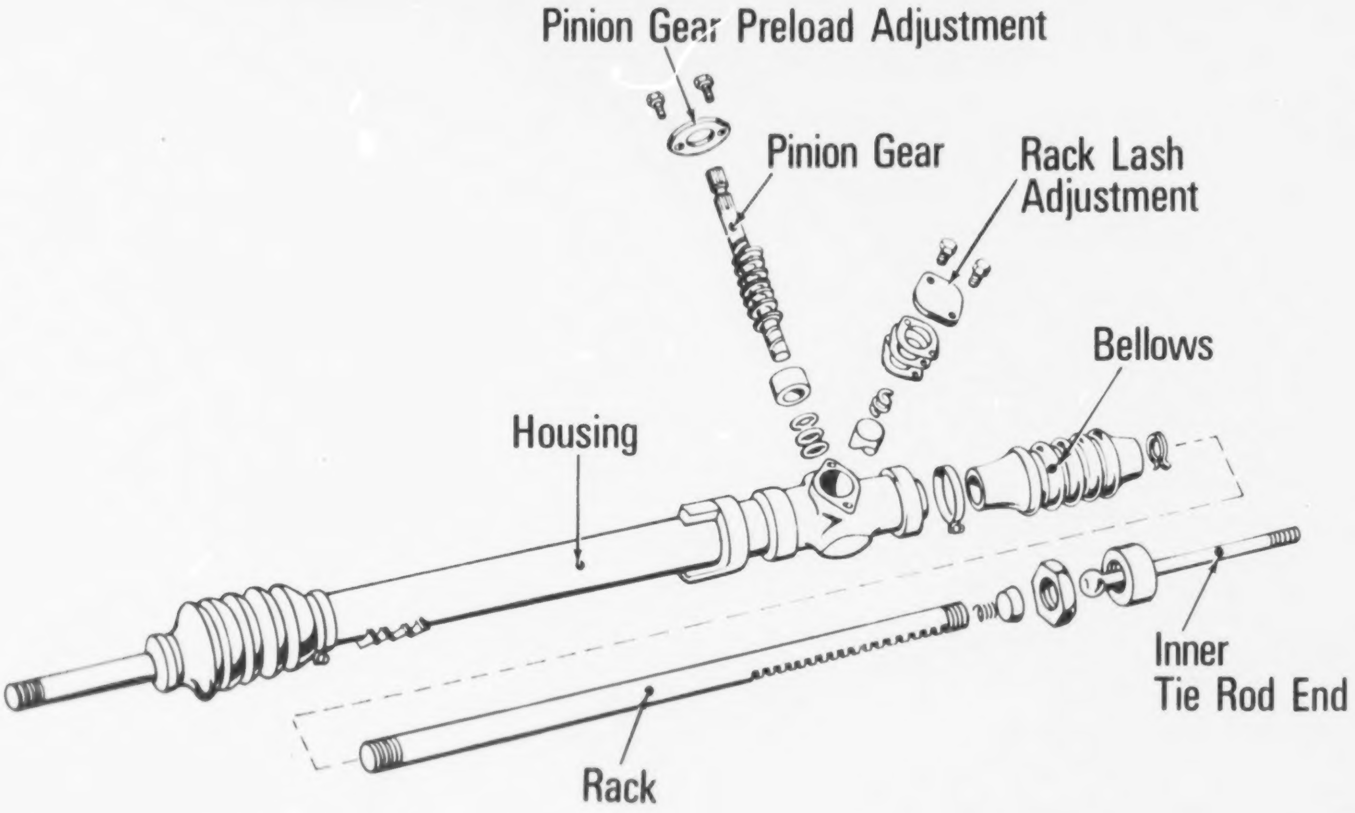

Pump Assembly
Power Cylinder
Fluid Line
Tie Rods
Control Valve
(Left Turn Pressure)
(Right Turn Pressure)

NOTE: Power steering design varies with the manufacturer; there are several types other than the one shown here.

Parts Specialist, Unit 6
Teacher Page 77

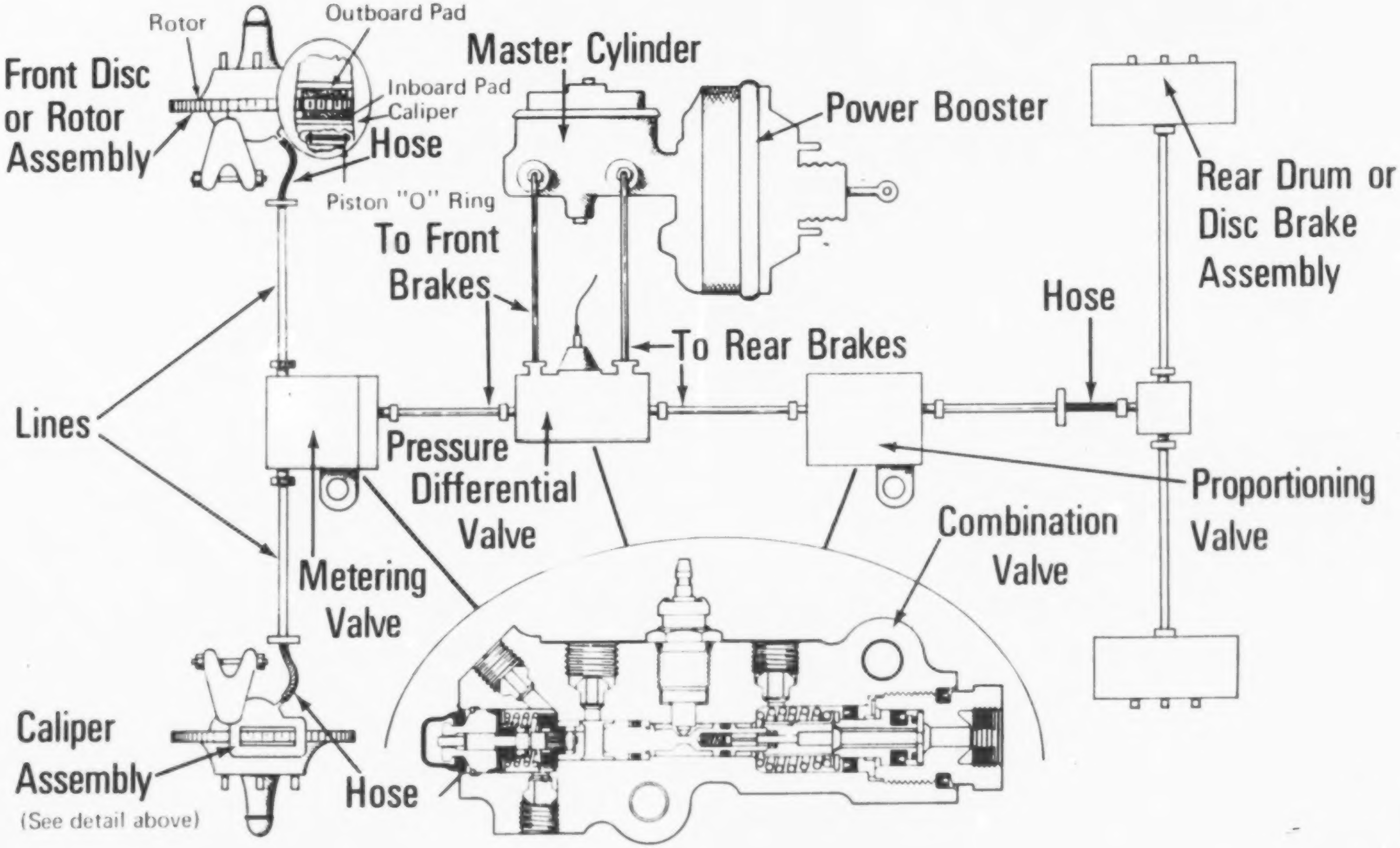
TM 19

Basic Components of a Rack and Pinion Steering System


Pinion Gear Preload Adjustment
Pinion Gear
Rack Lash Adjustment
Bellows
Housing
Inner Tie Rod End
Rack

Courtesy of MOOG AUTOMOTIVE INC., St. Louis, Missouri

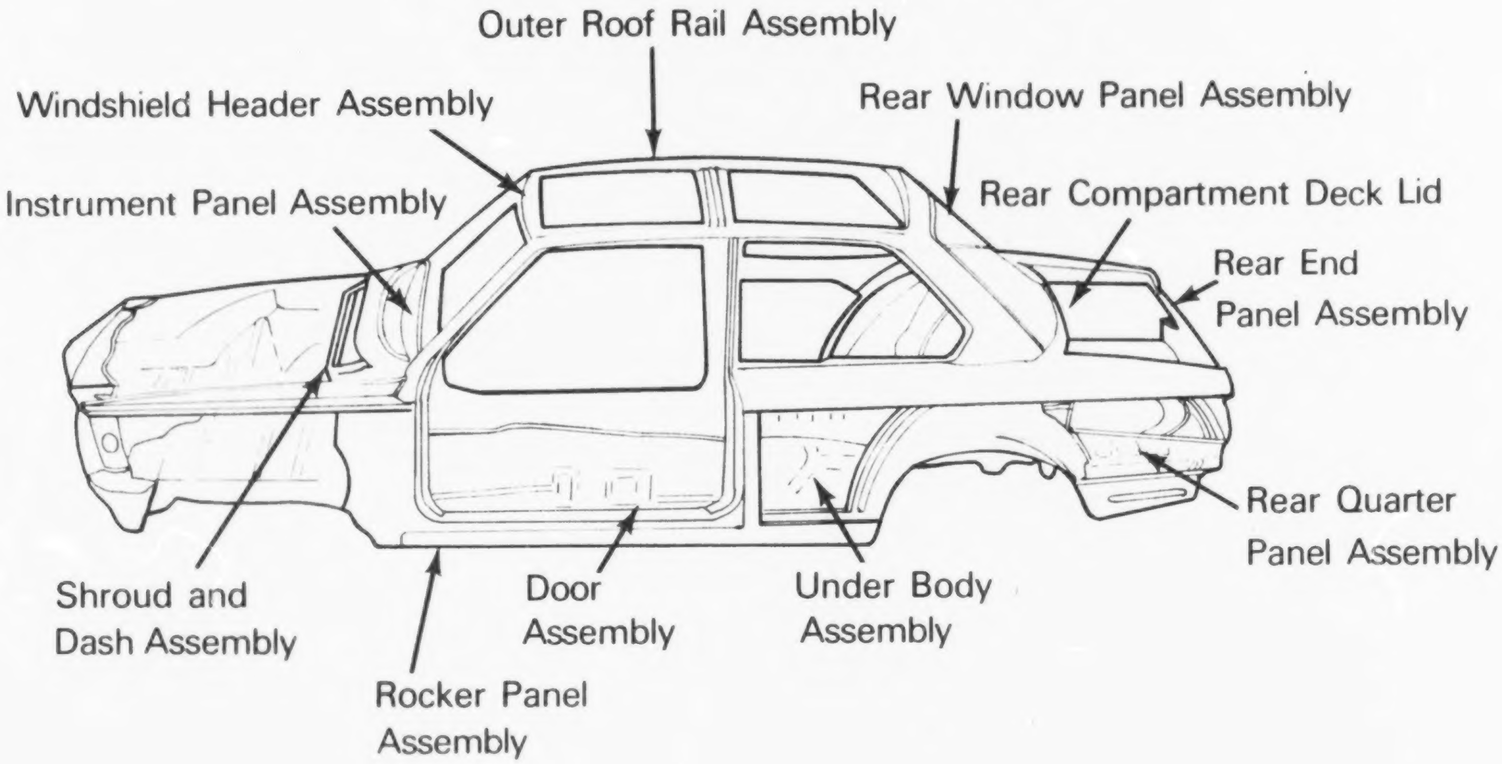
Basic Components of a Disc Brake System


Rotor
Outboard Pad
Front Disc or Rotor Assembly
Inboard Pad
Caliper
Hose
Piston "O" Ring
Master Cylinder
Power Booster
To Front Brakes
To Rear Brakes
Rear Drum or Disc Brake Assembly
Hose
Lines
Pressure Differential Valve
Metering Valve
Combination Valve
Proportioning Valve
Caliper Assembly
(See detail above)
Hose

Parts Specialist: Unit 6
Teacher Page 81

TM 21

Basic Components of a Body System


Outer Roof Rail Assembly
Windshield Header Assembly
Rear Window Panel Assembly
Instrument Panel Assembly
Rear Compartment Deck Lid
Rear End Panel Assembly
Rear Quarter Panel Assembly
Shroud and Dash Assembly
Door Assembly
Under Body Assembly
Rocker Panel Assembly

Parts Specialist, Unit 6
Teacher Page 83

TM 22

Automotive Parts and Systems Identification
Unit 6

Information Sheet

1. **Basic systems of an automobile and their definitions**

   a. **Body system** — Outer shell that provides protected area for auto components, people, luggage, etc.

   b. **Brake system** — Method by which an operator slows or stops a vehicle

   c. **Charging system** — Recharges the battery and maintains a supply of electrical current to meet the operating needs of the automobile

   d. **Cooling system** — Keeps the engine at its most efficient operating temperature during all engines speeds and driving conditions

   e. **Drive train** — Delivers the power developed by the engine through clutch or torque converter and transmission to the drive shaft, differential to the wheels for motion

   f. **Emission control system** — Devices on an automobile to control air pollution

   g. **Engine** — A machine that converts fuel into heat energy which produces mechanical force and motion

   h. **Exhaust system** — Conducts burned gases away from the engine and passenger compartment through catalytic converter, muffler, and pipes

   i. **Fuel system** — Supplies a combustible mixture of air and fuel to the engine cylinders to meet all driving conditions

   j. **Ignition system** — Provides a high voltage spark to ignite the fuel-air mixture in the combustion chamber

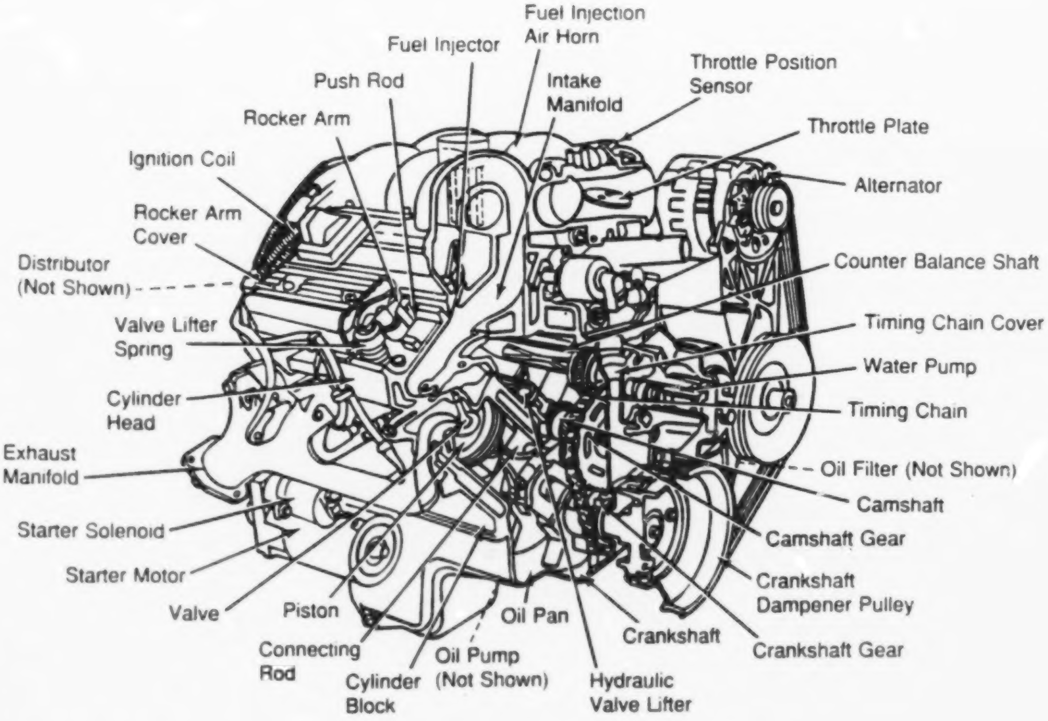
   k. **Starting system** — Converts electrical power from the battery into mechanical energy to crank the engine

   l. **Steering system** — Allows control of direction of the vehicle through a gearbox or rack-and-pinion assembly and linkage connected to the front wheels

   m. **Suspension system** — Mounted to the framework through a series of linkages and springs to allow the wheels to move up and down on rough roads while the rest of the vehicle remains fairly steady

Information Sheet

2. Basic components of an automobile engine

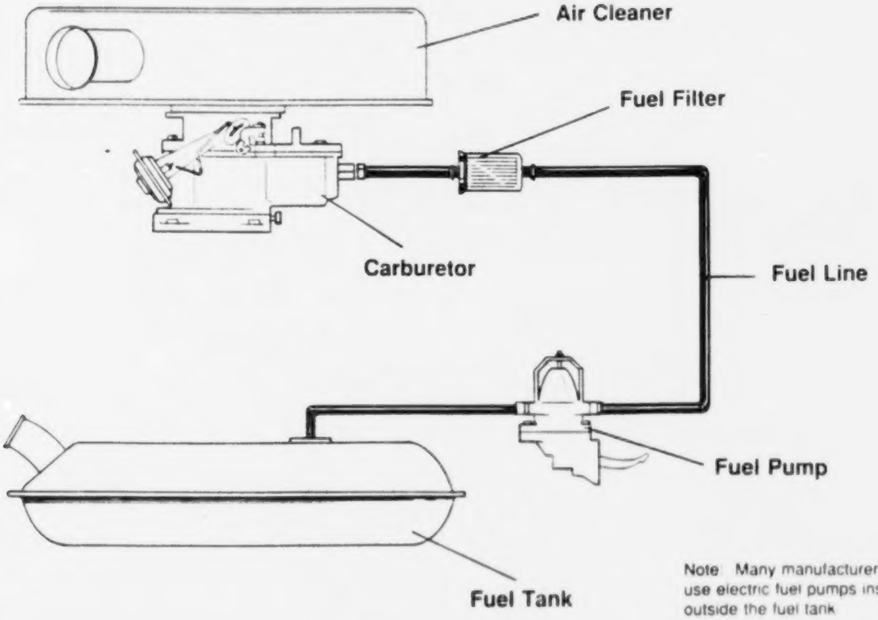

Fuel Injection Air Horn
Fuel Injector
Push Rod
Intake Manifold
Throttle Position Sensor
Rocker Arm
Throttle Plate
Ignition Coil
Alternator
Rocker Arm Cover
Distributor (Not Shown)
Counter Balance Shaft
Valve Lifter Spring
Timing Chain Cover
Water Pump
Cylinder Head
Timing Chain
Exhaust Manifold
Oil Filter (Not Shown)
Camshaft
Starter Solenoid
Camshaft Gear
Starter Motor
Crankshaft Dampener Pulley
Valve
Piston
Oil Pan
Crankshaft
Crankshaft Gear
Connecting Rod
Oil Pump (Not Shown)
Cylinder Block
Hydraulic Valve Lifter

Courtesy of General Motors Corporation, Service Technology Group

Note: Some engines are being designed with "pickup nodes" on the flywheel which replace the distributor by sending impulses directly to electronic ignition modules which fire individual cylinders at the proper time.

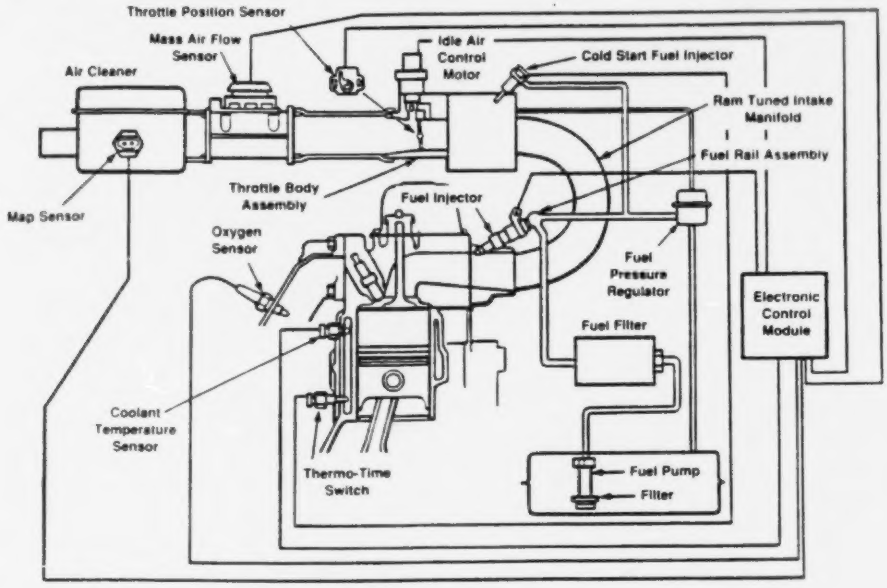
Information Sheet

3. Components of a typical carbureted fuel system


Air Cleaner
Fuel Filter
Carburetor
Fuel Line
Fuel Pump
Fuel Tank

Note: Many manufacturers now use electric fuel pumps inside or outside the fuel tank

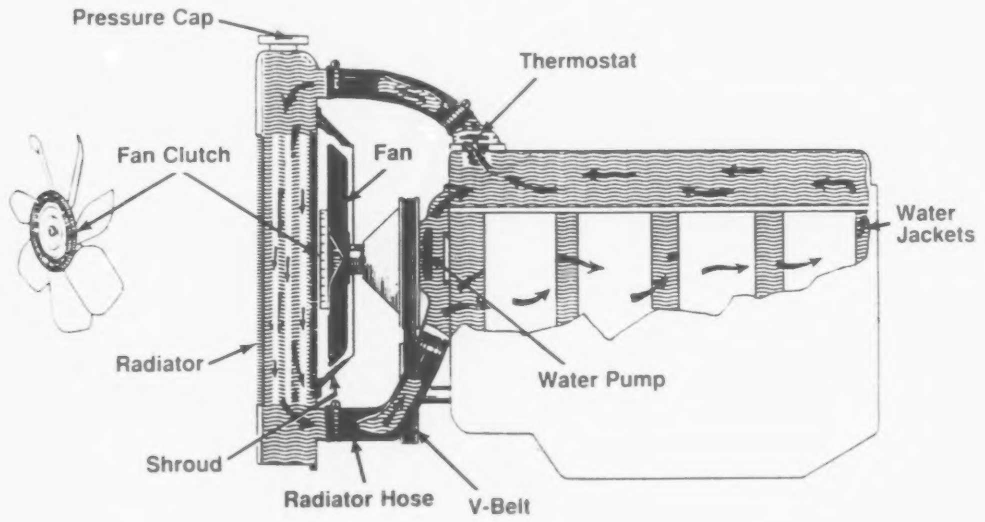
4. Components of a typical fuel injected fuel system


Throttle Position Sensor
Mass Air Flow Sensor
Air Cleaner
Idle Air Control Motor
Cold Start Fuel Injector
Ram Tuned Intake Manifold
Fuel Rail Assembly
Map Sensor
Throttle Body Assembly
Fuel Injector
Oxygen Sensor
Fuel Pressure Regulator
Electronic Control Module
Fuel Filter
Coolant Temperature Sensor
Thermo-Time Switch
Fuel Pump
Filter

Courtesy of AC Delco/General Motors Corporation

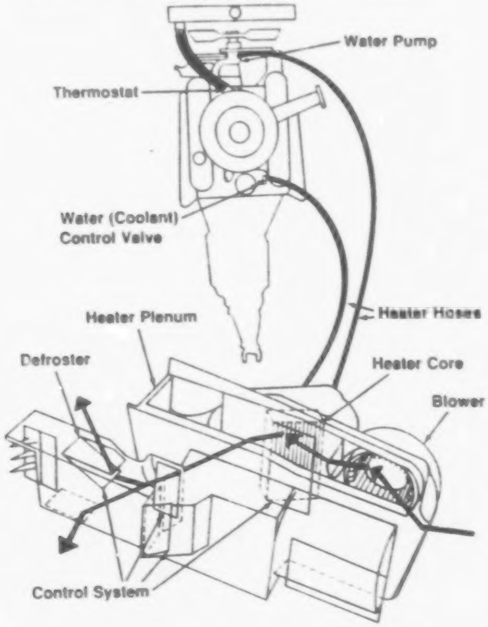
Information Sheet

5. Components of a typical cooling system


Pressure Cap
Thermostat
Fan Clutch
Fan
Water Jackets
Radiator
Water Pump
Shroud
Radiator Hose
V-Belt

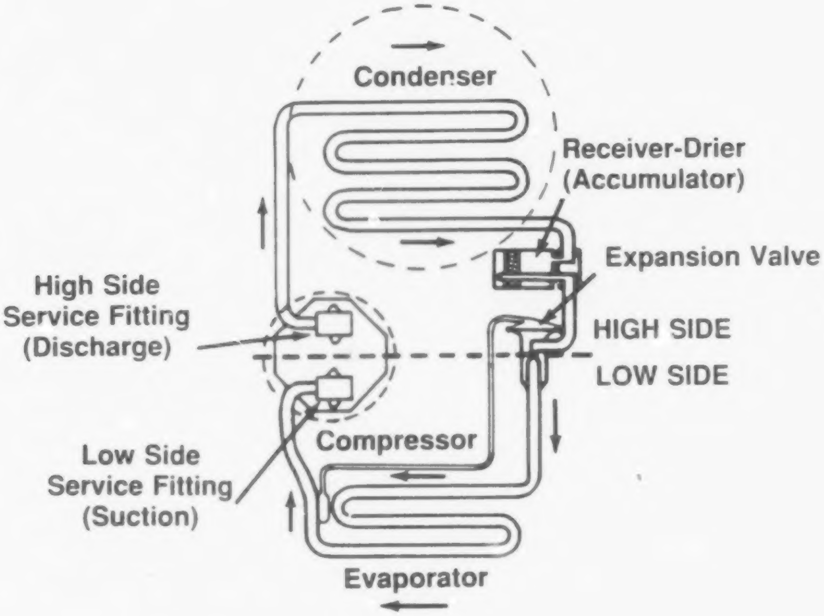
Note: Many vehicles are equipped with electric cooling fans attached directly to back of radiator.

6. Components of a typical heating system

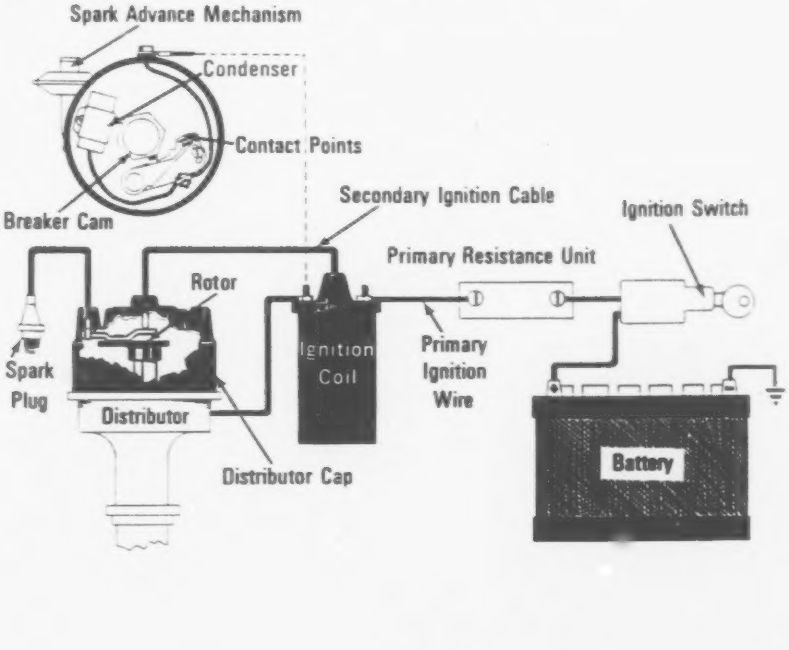

Water Pump
Thermostat
Water (Coolant) Control Valve
Heater Plenum
Heater Hoses
Defroster
Heater Core
Blower
Control System

Information Sheet

7. Components of a typical air-conditioning system


Condenser
Receiver-Drier
(Accumulator)
Expansion Valve
High Side
Service Fitting
(Discharge)
HIGH SIDE
LOW SIDE
Compressor
Low Side
Service Fitting
(Suction)
Evaporator

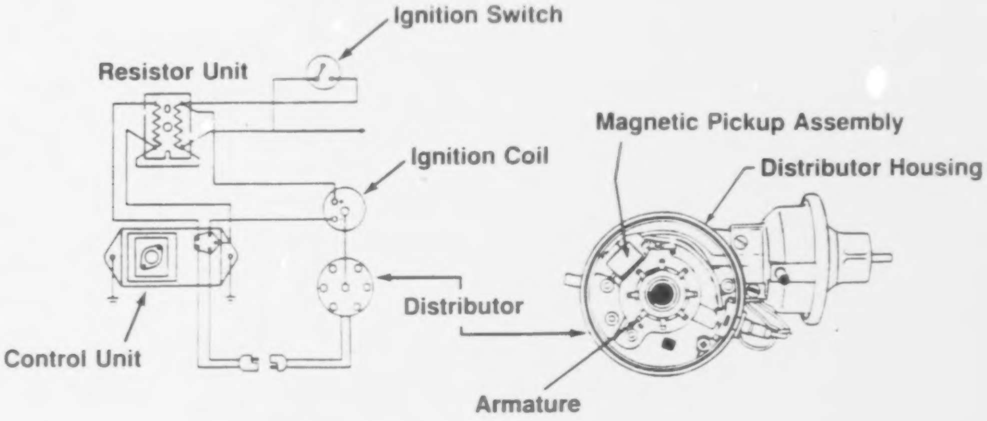
8. Components of a typical conventional ignition system


Spark Advance Mechanism
Condenser
Contact Points
Breaker Cam
Secondary Ignition Cable
Ignition Switch
Primary Resistance Unit
Rotor
Spark Plug
Distributor
Ignition Coil
Primary Ignition Wire
Distributor Cap
Battery

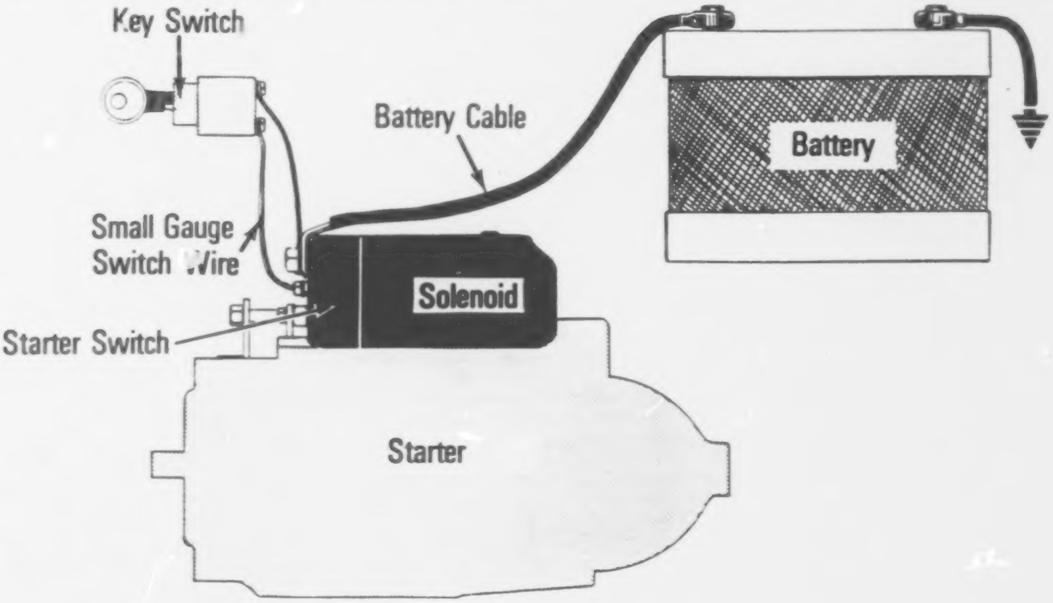
Information Sheet

9. Components of a typical electronic ignition system

Note: Some manufacturer's use "distributorless" ignition with a pickup coil located near the flywheel or crankshaft to signal proper position for timing ignition pulses.

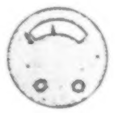

Ignition Switch
Resistor Unit
Magnetic Pickup Assembly
Ignition Coil
Distributor Housing
Distributor
Control Unit
Armature

10. Components of a typical starting system

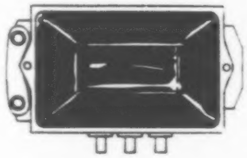

Key Switch
Battery Cable
Battery
Small Gauge Switch Wire
Solenoid
Starter Switch
Starter

Information Sheet

11. Components of a typical charging system

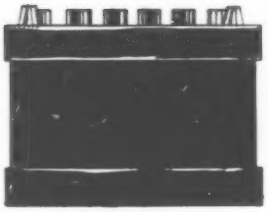


Ammeter

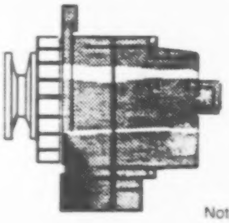


Regulator

Note: Indicator light replaces ammeter on some models



Battery

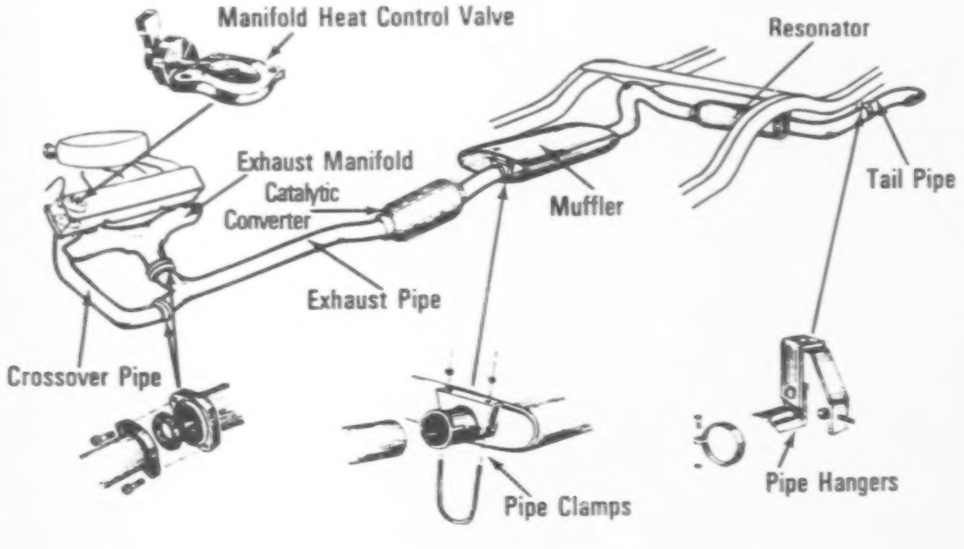


Alternator

Note: Most alternators have the regulator built in

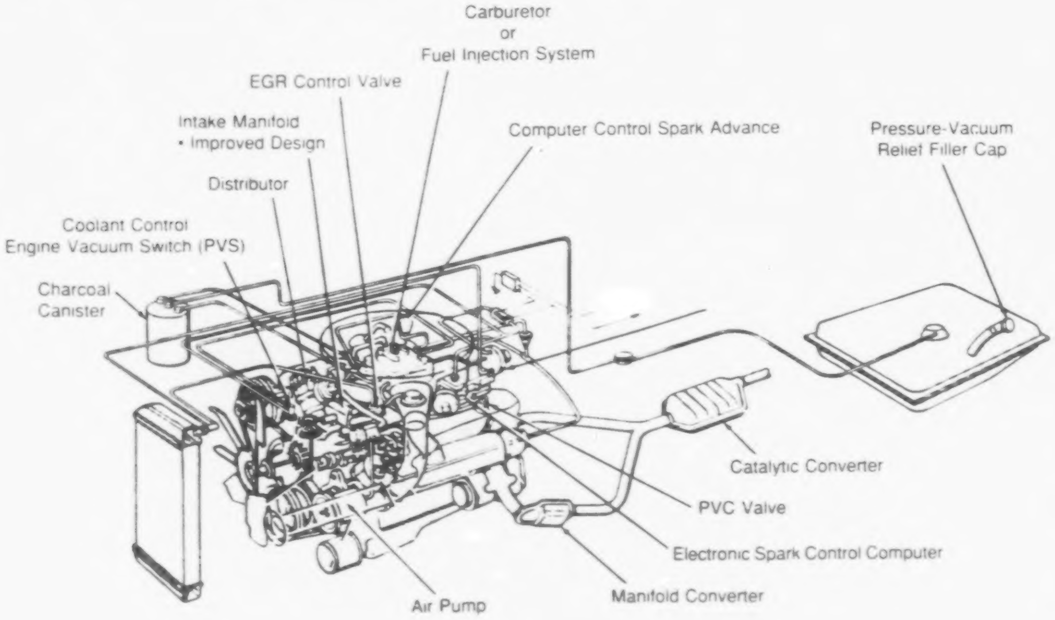
Note: Alternators which produce alternating current (AC) are much more efficient at low engine speeds than generators which produce direct current (DC) and have been used extensively since 1964 on most domestic and foreign produced automobiles sold in the U.S. Still, some vehicles will be encountered which are equipped with DC generators.

12. Components of a typical exhaust system

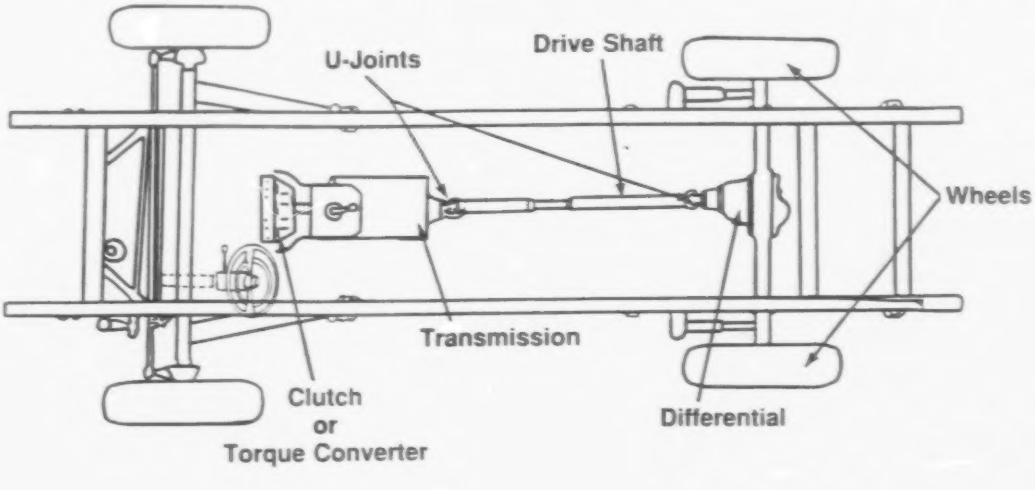

Manifold Heat Control Valve
Resonator
Exhaust Manifold
Catalytic Converter
Muffler
Tail Pipe
Exhaust Pipe
Crossover Pipe
Pipe Clamps
Pipe Hangers

Information Sheet

13. Components of a typical emission control system

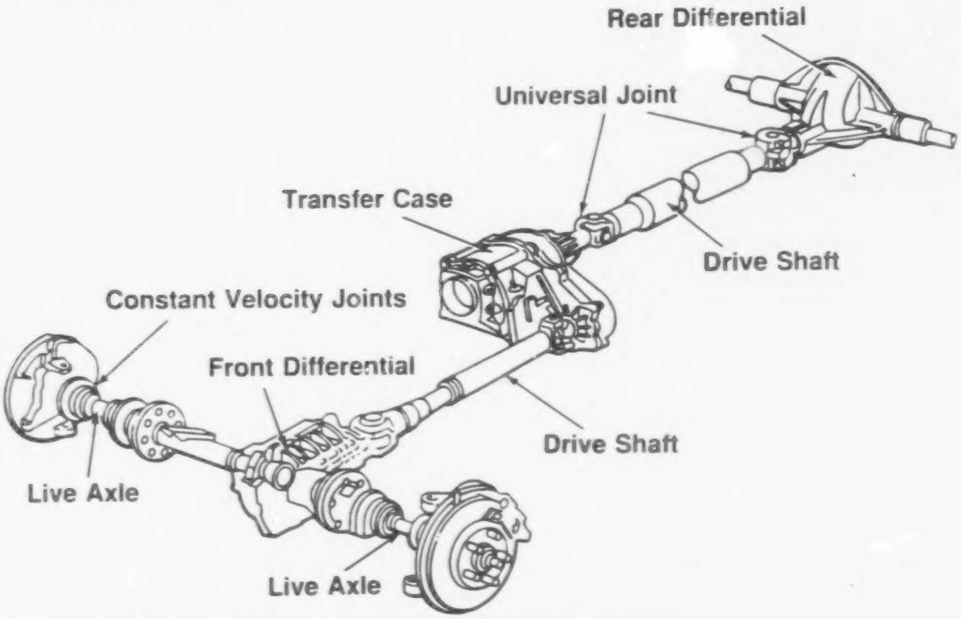

Carburetor
or
Fuel Injection System
EGR Control Valve
Intake Manifold
- Improved Design
Computer Control Spark Advance
Pressure-Vacuum
Relief Filler Cap
Distributor
Coolant Control
Engine Vacuum Switch (PVS)
Charcoal
Canister
Catalytic Converter
PVC Valve
Electronic Spark Control Computer
Manifold Converter
Air Pump

14. Components of a conventional two-wheel drive train


U-Joints
Drive Shaft
Wheels
Transmission
Clutch
or
Torque Converter
Differential

Information Sheet

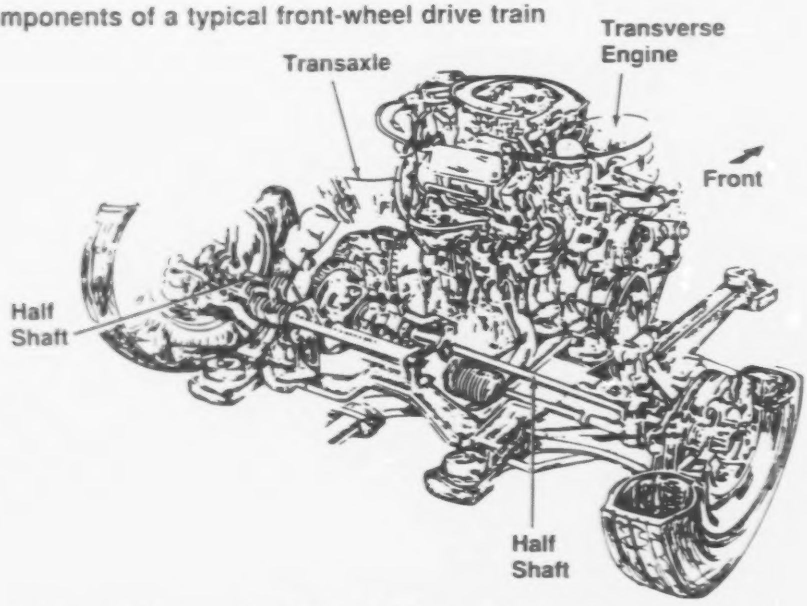
15. Components of a typical four-wheel drive train


Rear Differential
Universal Joint
Transfer Case
Drive Shaft
Constant Velocity Joints
Front Differential
Drive Shaft
Live Axle
Live Axle

Courtesy of Chevrolet Motor Division of General Motors Corporation

Note: CV joints are used to allow power to be transmitted to wheels that must turn to steer.

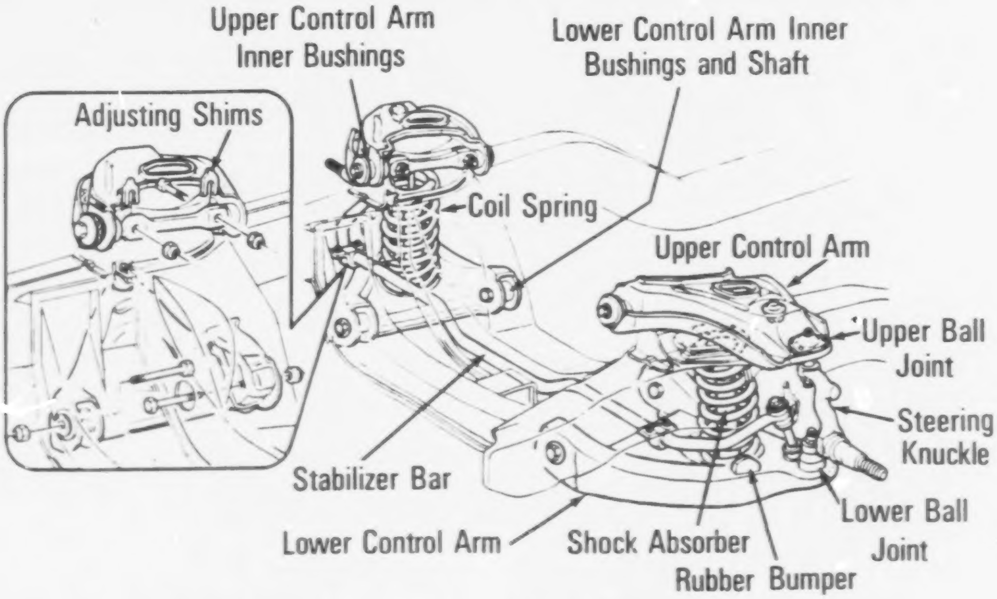
16. Components of a typical front-wheel drive train


Transaxle
Transverse Engine
Front
Half Shaft
Half Shaft

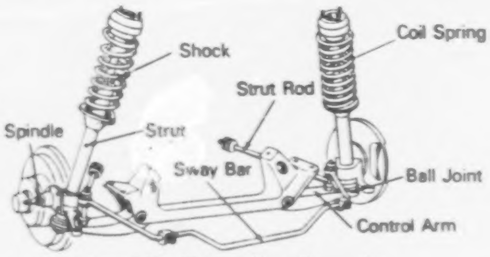
Courtesy of Chevrolet Motor Division of General Motors Corporation

Information Sheet

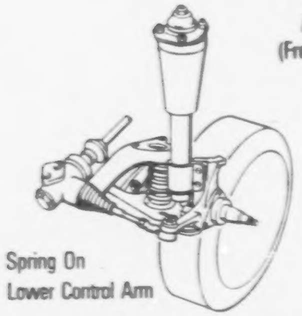
17. Components of a typical rear-wheel drive front suspension system

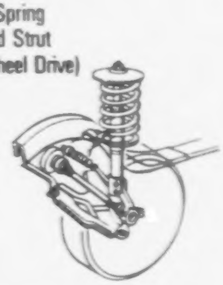

Upper Control Arm Inner Bushings
Lower Control Arm Inner Bushings and Shaft
Adjusting Shims
Coil Spring
Upper Control Arm
Upper Ball Joint
Steering Knuckle
Stabilizer Bar
Lower Ball Joint
Lower Control Arm
Shock Absorber
Rubber Bumper

18. Components of a McPherson strut suspension system


Shock
Coil Spring
Strut Rod
Spindle
Strut
Sway Bar
Ball Joint
Control Arm

Variations of MacPherson Strut Suspension

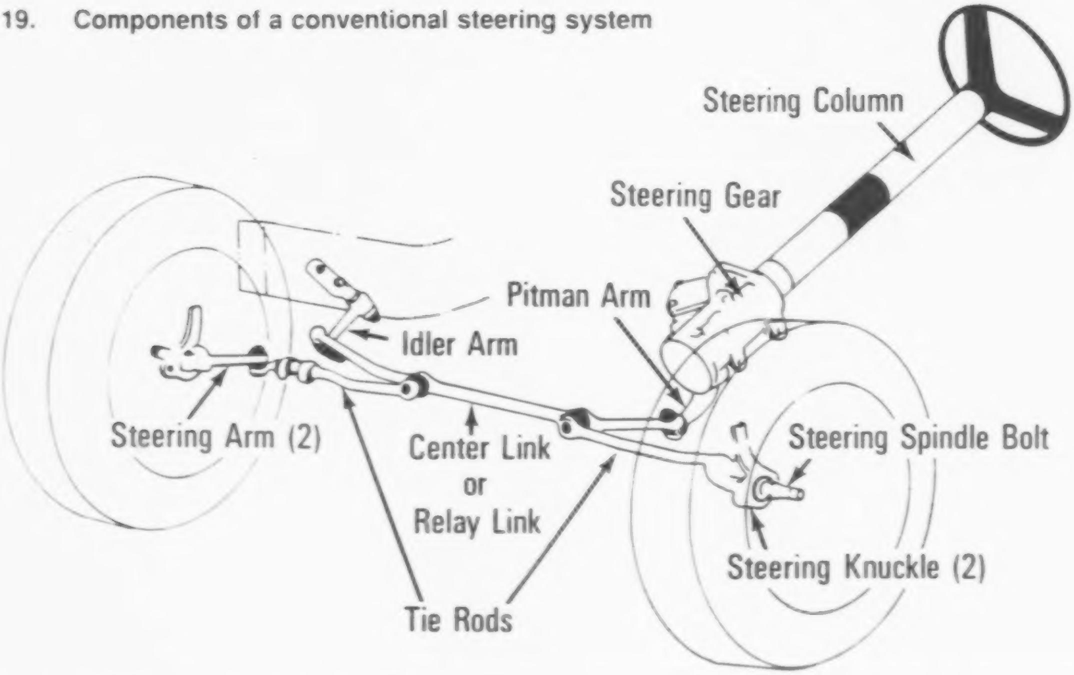

Spring On
Lower Control Arm


Coil Spring
Around Strut
(Front Wheel Drive)

Courtesy of MOOG AUTOMOTIVE, INC., St. Louis, MO

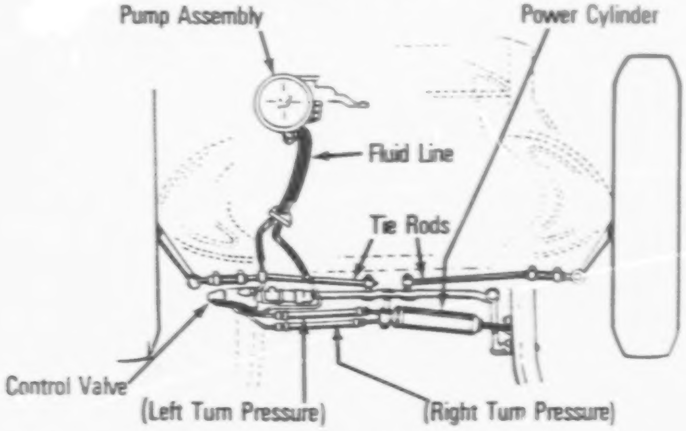
Information Sheet

19. Components of a conventional steering system


Steering Column
Steering Gear
Pitman Arm
Idler Arm
Steering Arm (2)
Center Link
or
Relay Link
Steering Spindle Bolt
Steering Knuckle (2)
Tie Rods

20. Components of a power steering system

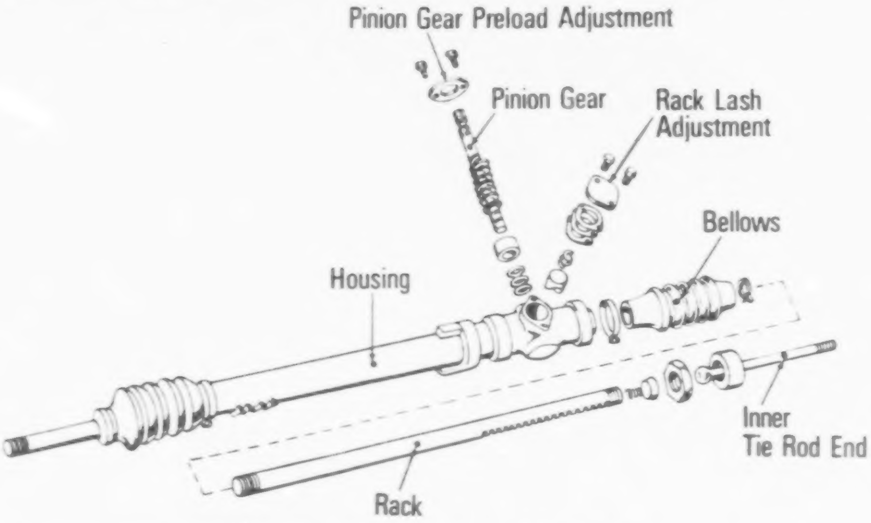
Note: Most power steering assemblies in modern automobiles are integrated into the steering box itself, where steering wheel motion opens and closes spool valves, directing hydraulic fluid to move right or left to assist steering effort. In many cases these systems power rack-and-pinion steering mechanisms on lighter cars and trucks. Illustrations provided by your instructor purposely show older power steering components to separate them for better study.


Pump Assembly
Power Cylinder
Fluid Line
Tie Rods
Control Valve
(Left Turn Pressure)
(Right Turn Pressure)

NOTE: Power steering design varies with the manufacturer; there are several types other than the one shown here.

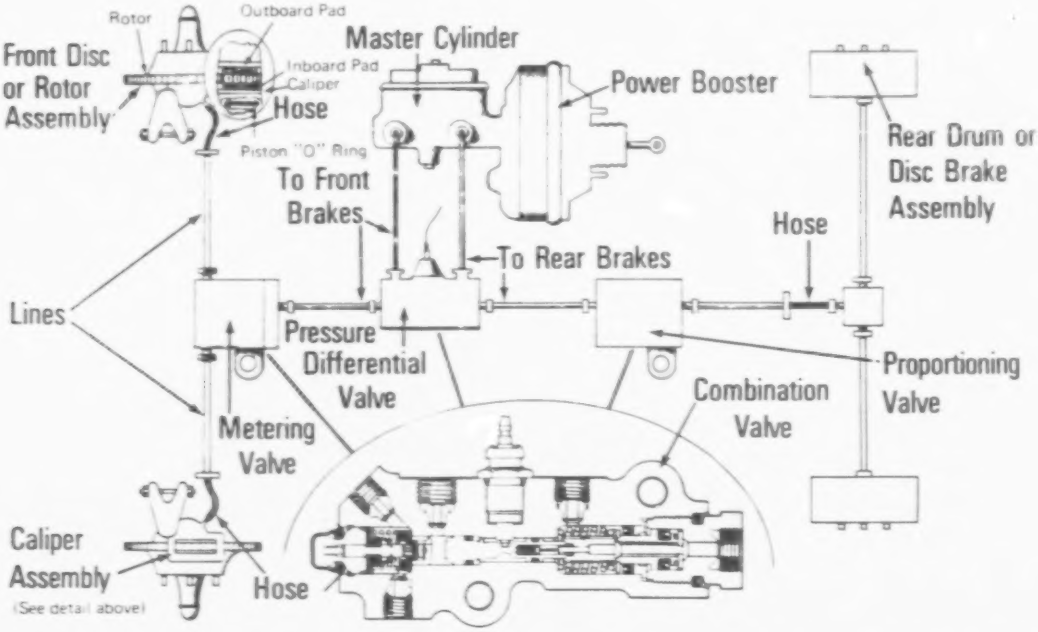
Information Sheet

21. Components of a typical rack-and-pinion steering system


Pinion Gear Preload Adjustment
Pinion Gear
Rack Lash Adjustment
Bellows
Housing
Inner Tie Rod End
Rack

Courtesy of MOOG AUTOMOTIVE, INC., St. Louis, MO

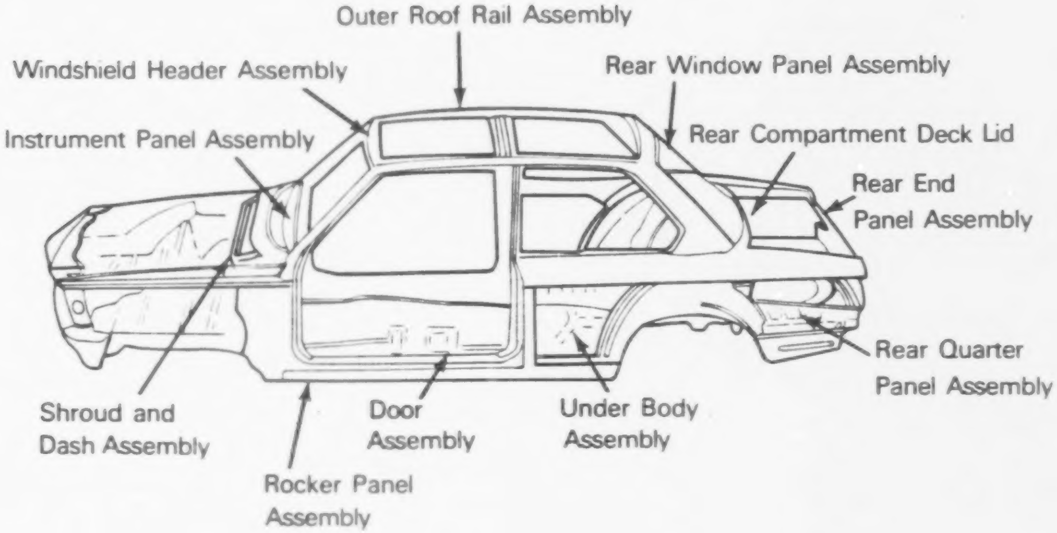
22. Basic components of a disc brake system


Rotor
Outboard Pad
Front Disc or Rotor Assembly
Inboard Pad
Caliper
Hose
Piston "O" Ring
Master Cylinder
Power Booster
Rear Drum or Disc Brake Assembly
To Front Brakes
To Rear Brakes
Hose
Lines
Pressure Differential Valve
Metering Valve
Combination Valve
Proportioning Valve
Caliper Assembly
(See detail above)
Hose

Note: A combination valve contains the metering valve, pressure differential valve, and proportioning valve all in one housing.

Information Sheet

23. Components of a body system


Outer Roof Rail Assembly
Windshield Header Assembly
Rear Window Panel Assembly
Instrument Panel Assembly
Rear Compartment Deck Lid
Rear End Panel Assembly
Rear Quarter Panel Assembly
Shroud and Dash Assembly
Door Assembly
Under Body Assembly
Rocker Panel Assembly

Automotive Parts and Systems Identification
Unit 6

Student Supplement 1—Motor Oils: The Differences are Important

One of the most popular consumables (a product that is sold over and over again) encountered by a parts specialist is motor oil. Proper maintenance of any internal combustion engine requires timely changes and filtration of motor oil, and that is the reason so much shelf space in parts stores and automotive sections of mass marketers is devoted to the different brands of oil and filters.

Other than the color of the containers, what is the difference, and why are there so many different lubricating oils for today's cars, trucks, and small engines?

Oil has a number of jobs to do in an engine, in addition to its main task of lubricating moving parts.

True, oil is a lubricant and provides a friction reducing film between tightly fitting parts such as piston rings and the cylinder wall, connecting rod bearings and the crankshaft surface, and camshaft and lifter surfaces. Sometimes, under extreme service loads modern engine oils provide a tough film only a molecule or two thick between these hot moving parts.

In addition, oil must clean the engine of combustion byproducts, so it must contain detergents that keep dirt, chemicals, and ash in suspension until they are removed by the oil filter and ultimately during a periodic oil change. Also, oil must be able to neutralize a number of acids that normally accumulate as a result of combustion byproducts and unavoidable condensation that occurs in engines that are operated in start and stop congested driving conditions.

Also, oil serves as a secondary coolant for the engine, carrying away some excess heat as it flows throughout the engine and falls back into the oil pan before being pumped back through the filter for another trip of lubrication and cleaning.

And, moreover, oil must be able to flow well at low temperatures as well as hold its film strength at high operating temperatures.

To accomplish all of these tasks, motor oil manufacturers begin with a highly refined petroleum based lube oil or a synthetic oil and add various detergent packages, acid neutralizing chemicals and additives that cause the oil to flow well at low temperatures as well as maintain its film strength under high load in hot temperatures.

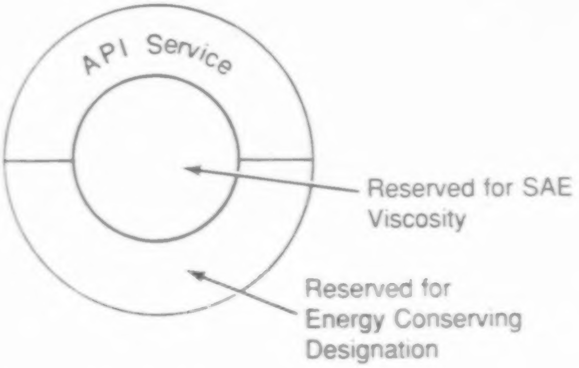
A basic understanding of the labeling system for motor oil is essential to a parts specialist's success in retail outlets.

Motor oils in the United States carry two classifications: Viscosity (the oil's ability to flow at a given temperature), noted by an SAE (Society of Automotive Engineers) number; and an API (American Petroleum Institute) classification, denoting the oil's ability to meet detergent, acid neutralization, and energy conserving standards.

Student Supplement 1

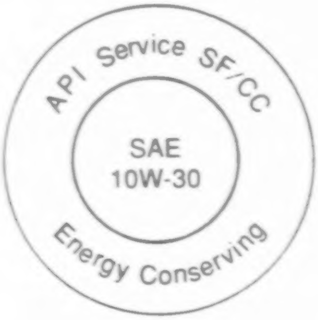
Viscosity is an expression of the internal friction of a given oil and is one of the most important considerations in its selection. The SAE viscosity number system is used worldwide to denote the temperature conditions in which the oil will lubricate best. An SAE 10 lubricates well at low temperature but becomes too thin to provide engine protection under hotter conditions. SAE 30 lubricates well at mid temperatures but becomes thick in extremely cold weather, thus reducing its effectiveness. Multigrade oils tend to do both within their design limitations. For instance, a 10W30 (the "W" stands for winter) operates at SAE 10 characteristics in cold conditions, but as outside operating temperatures and engine temperatures increase, it begins to thicken, to provide SAE 30 characteristics.

Most auto manufacturers, and some small engine makers, recommend multigrade oils for their products. Some do not. Therefore, it is quite important to follow the manufacturer's recommendations on lubricating oil selections for proper service and maintenance of the manufacturer's warranty.


API Service
Reserved for SAE Viscosity
Reserved for Energy Conserving Designation

The API service designations are also vital to selecting the proper motor oil for a given engine. "S" series designations are meant for gasoline fueled engines, while "C" series designations are meant for diesel applications.
These designations are noted by certain letters on the oil container, usually found in a circle (or "doughnut") on the side of plastic oil bottles, or, in some cases, on top of the metallic oil can lid.

For instance:



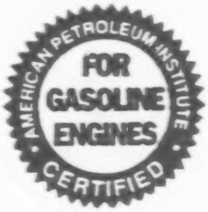
API Designations

Student Supplement 1

SC	Service typical of gasoline engines manufactured from 1964-1967. Oil designed for this service provides control of high and low temperature deposits, wear, dust, and corrosion in gasoline engines.
SD	Service typical of gasoline engines manufactured in 1968-1970. Oils designed for this service provide more protection against high and low temperature deposits, wear, rust, and corrosion in gasoline engines. SD oil can be used in engines requiring SC oil.
SE	Service typical of gasoline engines used in automobiles and some trucks beginning in 1972. Oil designed for this application provides more protection against oil oxidation, high temperature engine deposits, rust and corrosion in gasoline engines. SE oil can be used in engines requiring SC or SD oil.
SF	Service typical of gasoline engines used in automobiles and some trucks manufactured in 1980. SF oils provide increased oxidation stability and improved antiwear performance over oils that meet API SE designations. It also provides protection against engine deposits, rust, and corrosion. SF oils can be used in engines requiring SC, SD, or SE oils.
SG	Service typical of gasoline automobile and light duty trucks, plus CC classification diesel engines beginning in 1989. SG oils provide protection against engine wear, oxidation, engine deposits, rust, and corrosion. SG oils can be used in engines requiring SC, SD, SE, or SF oils.
SH	By late 1993, API SH designations were added to many motor oils, as manufacturers updated their lubricants to meet the higher demands of increasingly efficient auto and truck engines. This classification, too, can be used in applications calling for earlier oils.

In selecting oils for a particular engine, be certain to follow the manufacturer's recommendation. A good rule of thumb allows the use of higher than required specifications, but never lower.

Because oil technology and the demands of modern engines have changed rapidly over the past couple of decades, the API letter designations have become complex to some consumers—trying to keep up with what letter designation each of their cars may require. Now, however, the International Lubricant Standardization and Approval Committee (ILSAC) has introduced this symbol, referred to as the "starburst" which will be used on the front of all oil containers which are rated at the current highest API letter rating.



Student Supplement 1

This will allow consumers to find the latest, highest rating oil without having to know the codes of the API labels. In addition, the "starburst" symbol represents annual random testing by API of all oils carrying the symbol, and will be used as a licensing program for oils so labeled. The "starburst" was developed by the American Automobile Manufacturers Association and the Japan Automobile Manufacturers Association.

In an effort to reduce fuel consumption in the nation's auto and truck fleet, motor oil manufacturers have begun producing oils with less internal friction to improve engine efficiency. These oils will carry the API "Energy Conserving" designation in the circular specification "doughnut" label. The "ECII" designation will equate to a 2.7 percent increase in fuel economy over non "EC" oils, a small but significant increase in efficiency for automakers and drivers alike.

As of 1994, oils such as 10W40 and 20W50 did not meet the Energy Conservation standards because of their heavier viscosities. Therefore, they will not carry the ILSAC starburst, although they still meet the same rigid API standards as before. Only oils meeting the ECII standard and API's highest additive package ratings of the day will carry the starburst.

API's familiar "doughnut" symbol, covered earlier, will remain on oil containers of API-rated oils.

API classifications for diesel engines are CA, CB, CC, and CD. Check with owners manuals to determine which is required for any particular engine.

Automotive Parts and Systems Identification
Unit 6

Student Supplement 2—Basic Engine Performance Troubleshooting

Today's automobile and truck engines require that all of their systems be functioning properly to provide fuel economy, emission standards, and driving performance. Fuel systems are controlled by computer circuits which monitor outside air density and temperature, engine temperatures and load requirements, exhaust stream chemistry, speed controls, and various other inputs. The cooling system is vital to computer "decisions" on fuel mixtures, so are exhaust gas monitors and manifold pressure sensors. The fuel system is affected by air flow through the air cleaner, and the various signals the transmission is sending to the on-board computers. In all, a modern vehicle's systems are all interrelated more than those of older vehicles, and failure in one is certain to cause problems with emissions, economy, or drivability.

As a parts specialist some basic troubleshooting skills will come in handy as customers approach you with various problems they are trying to solve.

The following chart lists some basic problems and possible causes. Remember, these are only starting points in troubleshooting individual problems, but they are basic to most vehicles. Beyond these items, a customer should seek professional mechanical help in diagnosing exact causes.

Problem	Possible Causes
Engine idles rough	Ignition timing, broken sparkplug wires, idle mixture, vacuum leaks or something amiss in emission control system, air flow monitors malfunctioning on fuel injection systems, dirty or inoperative fuel injectors.
Hesitates on acceleration	Dirty carburetor or fuel filter, malfunctioning acceleration pump on carburetor, air leaks in fuel injection intake system, ignition timing, fouled or worn spark plugs or broken spark plug wire.
Difficult to start, or fails to start	Worn spark plugs, plugged fuel filter, improperly set automatic choke, ice or water in fuel from condensation in the fuel tank. Water on ignition components. Timing belt slipped or broken.

Student Supplement 2

Problem	Possible Causes
Stalls frequently	Automatic choke improperly set and possible dirty fuel and/or air filter. Vacuum leaks.
Performs sluggishly	Worn spark plugs, broken spark plug wire, dirty fuel and/or air filter, ignition timing or automatic choke out of adjustment. Vacuum leaks.
Knocking or clattering sound from engine on acceleration	Improper (too low octane rating) fuel. Ignition timing.
Poor fuel economy	Worn spark plugs, broken spark plug wire, improper ignition timing, dirty air cleaner, vacuum leaks, improperly inflated tires, slippage in clutch or automatic transmission.

Automotive Parts and Systems Identification
Unit 6

Student Supplement 3—Cooling/Heating System Operation and Maintenance

In most cases auto and truck engines today are cooled by circulating a coolant through the cylinder block and cylinder heads where excess engine heat is absorbed. The heated coolant is then pumped into a "radiator" (a heat exchanger which passes the coolant through small tubes exposed to large amounts of moving air, caused either by the vehicle's forward motion or by the action of a cooling fan.) Once the coolant has been relieved of its heat, it is repumped back through the engine to again collect excess heat to be dissipated through the radiator.

In early automotive days plain water was used in radiators as a coolant, but this caused rust inside engine blocks which plugged radiators and heater cores, and led to many boil overs because of water's relatively low boiling point (compared with modern coolants.) To relieve the freezing problem, alcohol-based "anti-freezes" were developed but they were relatively short lived and lost their effectiveness if allowed to sit where the alcohol could evaporate. They were replaced in the 1950s with coolants based on ethylene glycol and rust inhibitors. These coolants, which have been improved upon ever since, were capable of providing summer and winter protection to an engine for up to two years before their chemical additives broke down. Ethylene glycol based coolants, while very effective, do present a hazard if they are left where pets might drink them. For some reason these materials are quite attractive to dogs. Also, proper disposal of used coolant requires recycling to prevent harm to fish and wildlife.

On its way from the engine to the radiator the coolant is usually passed through a heat-sensitive valve called a thermostat, which is designed to open or close to maintain a given engine operating temperature. Usually this ranges from 140 degrees F. to 180 degrees F. depending upon the design of the engine. In many cases, however, coolant temperature will rise over 200 degrees F. as it leaves the hot surfaces of the engine and travels to the radiator. To prevent boiling and loss of coolant by evaporation in steam, most cooling systems use a pressurized radiator cap. This cap allows the pressure in the system to rise to about 15 pounds per square inch—raising the overall boiling point of the coolant. A malfunctioning radiator cap usually will not hold pressure, giving steamy coolant a chance to escape in loud jet-like hissing sounds, accompanied by foaming waves of hot coolant running out of the engine compartment.

Proper operation of the cooling system is vital to preventing overheating of mechanical parts, and warping of cylinder heads and blocks. Also, as the block and cylinder heads are cooled by the circulating liquid, the overall temperature of the engine oil, which also provides some cooling to the engine is maintained. In the case of automatic transmission-equipped vehicles, the transmission fluid temperature is regulated by passing it through a liquid-to-liquid heat exchanger located inside the radiator. In this way, the transmission fluid is maintained at roughly the same temperature as the coolant in the bottom of the vehicle's radiator.

Student Supplement 3

Proper cooling system operation depends upon a functioning water pump, thermostat, coolant hoses, radiator pressure cap, radiator and cooling fan. (In many cases cooling fans are belt driven off engine pulleys, while others are electrical fans bolted directly to the back of the radiator and controlled by various thermostats within the cooling and engine control computer system.)

Another important part of the cooling system is its function as a heating system for the inside of the vehicle during cold weather and at times when heat is needed to defrost the windows and windshield of the vehicle. This function is served by passing some of the heated coolant through hoses and instrument cluster valves to a small radiator (known as the heater core) inside the passenger compartment. In this way, engine heat is directed inside and transferred to the passenger compartment by the heater or defroster fan. This relatively trouble-free system has been used for years by nearly all auto manufacturers. Problems usually arise with heater systems only when leaks develop in the heater core or the connecting hoses and fittings. Such leaks usually occur within the passenger compartment leaving oily coolant messes on the floor of the vehicle, or causing a film on the inside of the windshield and a sweet, oily smell to permeate the vehicle when the defroster is used.

In most cases cooling system maintenance should be performed at least once every two years or 50,000 vehicle miles, including a replacement of rubber coolant hoses, hose clamps, water pump drive belts, and the coolant itself.

In general, hoses should be changed as a set because when one has deteriorated enough to leak, burst or become weak, it follows the others probably are in similar condition. It is also wise to replace hose clamps with new ones each time a hose is replaced, particularly if the original factory hose clamps are still on the vehicle. Original equipment hose clamps can easily fail once they have been loosened. Aftermarket clamps are much more reliable.

Thermostats need only be changed when they malfunction (either remain open, causing the engine to never reach proper operating temperature, or remain closed, causing the engine to overheat shortly after it is started.)

In most cases, water pumps should be replaced only when they leak or malfunction for some other reason. Some engines, however, drive the water pump with a timing belt that also drives the camshaft. In this case, the water pump should be changed each time the timing belt is changed (every 60,000 miles) as a precaution against a malfunctioning water pump causing damage to the timing belt.

Automotive Parts and Systems Identification
Unit 6

Student Supplement 4—Exhaust System Function and Maintenance

The proper operation of the exhaust system of a motor vehicle is vital to engine operation **and** the safety of the vehicle occupants.

As fuel is burned in the engine, the hot, expanding spent gases must be vented from the engine through its exhaust valves and away from the vehicle. The gases, made up mainly of nitrogen, oxygen, carbon monoxide (highly poisonous and odorless), carbon dioxide, water vapor, and unburned hydrocarbons.

An exhaust system must not leak or else it will pose a hazard to the occupants of the vehicle from carbon monoxide poisoning. Carbon monoxide binds rapidly with the hemoglobin in the blood and prevents the blood from carrying oxygen throughout the body. In essence, one suffocates while breathing when exposed to odorless carbon monoxide.

Functionally, the exhaust system must operate properly for maximum engine efficiency and noise reduction. The exhaust system must carry gases away quickly to allow the engine to continue to "breath." Actually, exhaust systems are designed to "scavenge" exhaust gases away from the engine in a manner that actually helps draw more fuel/oxygen mix into its cylinders as exhaust gases are escaping through the system on their way through the tailpipe.

To meet federal air pollution standards by reducing the amount of nitrogen and carbon compounds exhausted into the air, manufacturers have designed highly sophisticated exhaust systems made up of "tuned" (specially shaped) exhaust manifolds, catalytic converters, resonators, mufflers, and exhaust pipes.

As the spent gases exit the engine they are passed through a catalytic converter which contains a platinum and/or palladium material (either beads or a honeycomb shaped filter). Here, in the presence of oxygen pumped in from an auxiliary air pump driven by the engine, many of the unburned hydrocarbons and nitrogen compounds are burned catalytically without flame.

A catalytic converter, the key component of the vehicle's pollution control system and vital to passing clean air inspections, will last many thousands of miles, unless it is polluted through the use of leaded gasoline. Lead from such fuels (included as a valve lubricant and "knock retardant" for engines developed before 1974) coats the catalyst particles, rendering them useless. And, because catalyst material is quite expensive, catalytic converters are very expensive to replace.

From there, the gases continue through the system's resonators (for noise control) and the muffler, for further noise control through expansion. Once these gases expand in the muffler, they slow their pace somewhat and exit the muffler through the tailpipe in a low purr or rumble, instead of a staccato-like high-decibel noise found in unmuffled engines.

Student Supplement 4

Because exhaust gases are corrosive and because they range from 1,700 degrees to 500 degrees, an exhaust system must be designed to prevent burns, fires, and leaks. Therefore, many modern systems are fabricated entirely of stainless steel (rust and corrosion resistant) components and insulated converters and resonators.

Usually the exhaust system is designed to operate 50,000 or more miles (many times up to 100,000 miles if the vehicle is operated at highway speed most of the time) without service. Still, mufflers do rust, corrode, and leak eventually. When they do, they should be replaced with mufflers of the same design and capacity as the original equipment. Also, for the best results exhaust systems should be reassembled by welding. Many aftermarket exhaust components can be assembled with U-clamps and bolts, but a welded system, assembled by a competent welder, is far superior and less likely to leak than a system clamped together.

As a parts specialist, you should also realize when one part of an exhaust system is failing, others (pipes, hangers, resonators, etc.) may also be ready to fail. With this knowledge, you should always determine if additional parts may be needed by the customer to do an adequate job of repairing the system in question. The customer's safety, well being, and your increased sales depend on this knowledge.

To determine the proper muffler, resonator, or other exhaust system component for a given vehicle, refer to the Vehicle Identification Number to determine the exact engine and exhaust system identified by the manufacturer. Such numbers are coded into various parts catalogs, allowing exact duplicates of components to be purchased and installed, instead of using "one size fits all" mufflers, hangers, clamps, etc.

Automotive Parts and Systems Identification
Unit 6

Student Supplement 5—Battery Maintenance, Selection, and Troubleshooting

The heart of any vehicle's electrical system is the battery—usually a lead/acid storage battery sized to provide power for starting the vehicle's engine in weather extremes and operating all of the vehicle's original electrical equipment.

The battery provides power for the cranking motor (starter) while at the same time energizing the engine's ignition system and related computers and electrical fuel pumps. Once the engine has started, the starter motor is deactivated and the engine begins turning the alternator at sufficient speed to begin recharging the battery for the current it expended in starting the engine. As the battery begins to approach full charge again, a built-in regulator circuit in the alternator begins to slow the flow of charging current to the battery to prevent overcharging and "boil over" of highly corrosive sulfuric acid electrolyte within the cells of the battery.

As a parts specialist you will be called upon to sell batteries, and solve a number of battery related problems as customers complain of slow-to-start engines, "dead" batteries, etc.

In sizing a replacement battery, be certain to select one of proper outside dimensions so it will fit in the battery compartment of the vehicle in question. Then, be certain its capacity is large enough to handle the electrical requirements of the vehicle. In most cases battery manufacturers provide a cross-reference which will allow one to match the aftermarket battery with the equivalent original equipment battery rating.

In all cases, never recommend a battery of smaller capacity than the original equipment unit called for. And, in many cases, as vehicles get older, they require more current capacity to make up for aging electrical systems and wearing electrical components.

Some troubleshooting tips for battery related problems include:

Problem	Possible Cause
Clattering starter solenoid and no starter motor action	Weak, discharged, or "dead" battery, corroded battery cables.
Slow starter motor, lights brighten as engine speed increases, dims as engine slows.	Discharged battery, dead cell in battery.
Slow or no starter motor action, battery plates showing when vent caps removed	Battery needs addition of distilled water, regulator may be overcharging battery

Student Supplement 5

In all cases, customer battery should be load tested to determine if it is unfit for further use or needs only a charge to bring it back to serviceable condition.

When installing a battery be certain to clean and inspect all cables attached to the battery. Corrosion, rust, and grease can act as insulators to current flow, causing a good battery to seem as if it is discharged or "dead." Always replace battery cables with cables of same size to allow for proper current flow under high loads.

If starting problems can be traced to the starter motor itself, the usual remedy is to direct-exchange the faulty starter motor rather than rebuilding the worn unit. (Manufacturers of remanufactured parts take worn units, refit them with new bearings, bushings, and brushes to make reconditioned units to sell at a fraction of the cost of new starters). The same principal applies to voltage regulators which may be at the root of some "battery" problems. In most cases on today's vehicles, the regulator is built in to the alternator, and must be replaced as a unit with the alternator.

Older automobiles (built before 1964) used generators, which were rather inefficient at charging batteries unless engine speed was increased beyond an idle. Also, most of these vehicles were equipped with a separate mechanical voltage regulator which could be replaced independently of the generator.

Automotive Parts and Systems Identification
Unit 6

Student Supplement 6—Brake System Operation and Maintenance

Two basic types of vehicle brakes are common in today's car and truck—drum and disc brakes.

Drum brakes, which date back to early automotive design, consist of a cast iron drum which is bolted to and rotates with the wheel. Within this drum are arched shoes lined with friction linings to contact the inside of the rotating drum when hydraulic pressure is applied to a hydraulic cylinder and piston assembly actuating the shoes which contact the drum, create frictional heat—thus expending energy—and cause the wheel to slow or stop. Once the brakes are no longer needed, return springs pull the shoes away from the inside of the drum.

Disc brakes use friction pads to squeeze a rotating disc or rotor which is bolted to the vehicle wheel. Once hydraulic pressure is applied to a hydraulic cylinder and piston actuating the pads, the pads contact the rotating rotor, create heat—thus expending energy—and cause the wheel to slow or stop. Once the brakes are no longer needed the piston retracts slightly, allowing the pads to release the rotor, although they remain within thousandths of an inch of one another.

In most cases today, disc brakes are found on nearly all front brakes, while most rear brakes continue to be drum type. Some cars are equipped with four-wheel disc brakes, although they are more expensive to build.

In general, the advantage of disc brakes is their resistance to "fade" or weakening under high temperatures of hard braking or extended periods of braking. Also, disc brakes are less likely to fade when they are soaked with water, and provide more straight-line stopping action because they are less likely to pull. In addition, disc brakes are self adjusting as the pads wear against the rotor.

In light trucks and front wheel drive vehicles the front brakes assume roughly 80 percent of the braking load because of the weight of the front mounted engine. Because of this, disc brakes are superior for front wheel use. Also, in most cases these brakes are cross linked right front to left rear, and left front to right rear (a dual diagonal split system). This allows straight line braking and provides 50 percent of the braking capacity in case of failure of either of the two braking systems.

Brake system maintenance usually involves resurfacing drums and rotors and replacing or "relining" brake shoes and pads when they become worn and unserviceable.

Most automotive stores are equipped with lathes which can finely machine away imperfections in brake drums and rotors and return them to a like-new surface. In all cases, however, it must be emphasized such lathe work must not be done if the drums or rotors have been resurfaced enough to reduce their thickness beyond factory specifications. (Check with manufacturer specifications before "turning" any drum or rotor. If the units are too thin they must be replaced.)

Student Supplement 6

New and remanufactured brake shoes and pads are available, and are equipped with either an asbestos lining or one of semi-metallic composition. Semi-metallic materials are much more able to withstand the heat generated by modern braking action (above 500 degrees F.), and they do not produce hazardous dusts as do asbestos linings. Still, some autos and trucks require asbestos components, according to their specification sheets. Asbestos linings begin to fail above 400 degrees F.

Many problems arise in disc brake overhauls as the brakes squeal or shudder once they have been in service a short time. In many cases this can be traced to the improper lining surface, grease on the rotors, or improper resurfacing of the rotors.

When a customer brings drums and rotors for resurfacing, be certain to check with application catalogs for the correct relined or new brake linings. Also, ask if new grease seals will be needed for the job, because in most cases the wheel bearings will be disassembled as the drums and rotors are removed.

Additional brake service usually is isolated to leaks in the wheel hydraulic cylinders, brake lines, or in the master cylinder. Except for brake lines—usually made of steel or steel-reinforced rubber—which must be replaced if they leak, these components are capable of being rebuilt. Wheel cylinder kits including springs, seals, and pistons; and master cylinder kits including similar parts, are available for the customer who is familiar with the process. Also, remanufactured parts are readily available.

To actuate the modern brake system a highly refined and consistent hydraulic fluid is necessary. The U.S. Department of Transportation (DOT) rates brake fluids, and manufacturers design their vehicles around the DOT ratings for temperature exposure. The manufacturer's recommendation on the specification of brake fluid should **NEVER** be ignored. Brake fluids are not all the same, and they do **NOT** mix.

These are the basic types of classifications of hydraulic brake fluids:

DOT 3 — A conventional type brake fluid with a minimum dry Equilibrium Reflux Boiling Point (ERBP) of 401 degrees F. and a minimum wet ERBP of 284 degrees F.

DOT 4 — This is a conventional type brake fluid with a minimum dry ERBP of 446 degrees F. and a minimum wet ERBP of 356 degrees F.

DOT 5 — A unique silicone based brake fluid with a minimum dry ERBP of 500 degrees F. and a minimum wet ERBP of 356 degrees F.

To prevent uneven braking, brakes on the same axle, or same location on the car in the case of front wheel drive vehicles, should always be replaced together (both front and/or both back brakes). Otherwise newer brakes might be more efficient, causing the vehicle to swerve under severe braking.

In all cases, for safety, vehicle manufacturer specifications must be followed in replacing brake parts and related components.

Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 1—Analyze Situations to Determine Correct Motor Oil Selection

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers show cognitive grasp of student-supplement information	______

Introduction: With a host of motor oils available at mass market stores, automotive stores and discount stores, the selection of the proper lubricant for an auto or truck engine can be confusing. As a parts specialist you will need to be aware of the differences in motor oil, and be able to guide customers to the correct choice for their vehicle.

Directions: Review Student Supplement 1, then read the following questions and answer each on the blanks provided.

Scenario 1

A customer is shopping for motor oil in the store in which you work on a day when all motor oils have been put on sale for the same price. She tells you she owns a 1991 Ford Probe.

What API grade motor oil is required by this automobile?

a. ____

What other API grade motor oil could safely be used in this vehicle?

b. ____

Scenario 2

Because your store has a winter sale on single grade SAE 40 Pennzoil by the gallon, a customer wants to take advantage of the sale to change the oil in his snow-plow equipped Jeep. He lives in a mountain valley where the temperature regularly dips below 0 degrees F. What would you recommend about this purchase and why?

a. ____

____

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Assignment Sheet 1

If your store also had oils of the following SAE weights: 20W50, 20W40, 10W30, 15W40, and 5W30, which would recommend to your snow plowing customer and why?

b. ______________________________

____

Scenario 3

A customer owns a diesel powered Kubota tractor which she uses to do odd jobs around her acreage and mow some adjacent pasture during the summer months. Temperatures sometimes climb to well over 100 degrees in her area. Would you recommend an SG or an SH API rated oil for her tractor? Why?

a. ______________________________

If you would not recommend one of these oils, what would you recommend, and why.

b. ______________________________

Scenario 4

A customer browses your motor oil shelves for an extended period of time and finally tells you he cannot find the proper API specification oil for his prized 1965 Chevrolet Impala. He says his owner's manual tells him he needs an "SC" service oil, and all he can find on the shelves is SG and SH. What do you tell him?

a. ______________________________

In your opinion would he be better off to find a source of SC oil to use in his classic? Why?

b. ______________________________

Scenario 5

A customer asks you to explain why a motor oil would have detergent in it. How would you explain this?

a. ______________________________

What is another function of motor oil, other than lubrication, while it is in an engine?

b. ______________________________

Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 2—Analyze Situations to Determine Possible Engine Problems

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
Directions have been followed	_____
Answers show cognitive grasp of student-supplement information	_____

Introduction: Invariably, a parts specialist will be faced with a customer who has car problems and wants to know how to deal with them. How does one know where to look to answer the question? By asking how the vehicle responds in certain situations. Through a basic knowledge of where to begin, troubleshooting can lead to determining what malfunction is occurring.

Directions: Review Student Supplement 2, then read the following questions and answer each on the blanks provided.

Scenario 1

A customer tells you her compact car is only getting about 12 miles per gallon of gasoline as she commutes on the highway to school in a nearby town. Your cousin has a similar auto and you know it is capable of 32 miles per gallon when driven on the highway. What are five items or systems you would check?

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

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Assignment Sheet 2

Scenario 2

Your brother-in-law complains that his late model full size car makes a clattering noise any time he accelerates on the highway, whenever he begins to climb a hill while using cruise control, and many times when he accelerates from a stop sign. What are two things you would suggest he check?

a. ____

b. ____

Scenario 3

You have a 1967 Chevelle with a 396-inch V8 engine and a Quadrajet four-barrel carburetor. It runs fine idling, and once you accelerate through the gears. But, from a stop sign, or when you try to "burn the tires" leaving the drive-in, the engine embarrassingly tries to die, jumping and loping until you can "nurse" it back to life and accelerate slowly. You have just replaced all the spark plugs, ignition wires, distributor cap and points, and condenser. What are three other things that could be wrong?

a. ____

b. ____

c. ____

Scenario 4

A customer complains that her 1991 Dodge Laser runs rough at idle even though she just had the fuel injectors cleaned and the fuel system serviced. What are three other items or systems you would suggest she have checked?

a. ____

b. ____

c. ____

Assignment Sheet 2

Scenario 5

A friend of yours has an old pickup truck that sits outside year 'round and is used only once in awhile. Last night, the temperature dipped to five degrees below zero, and today it hasn't risen over 20 degrees. Your friend calls you and says the pickup wouldn't start when he tried to use it to haul some firewood although it ran fine three days ago when he put a couple gallons of fuel in it to bring it up to the quarter tank mark. The starter works fine, although slowly, but the engine just won't start—even with the hand choke pulled all the way out. What would be a logical first guess as to the answer to this problem?

a. ______________________________

How could your friend prevent this from happening again?

b. ______________________________

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Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 3—Analyze Situations to Determine Possible Cooling/Heating System Problems

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers show cognitive grasp of student-supplement information	______

Introduction: Some of the more maddening problems with vehicles stem from trouble with cooling and heating systems. Parts specialists will certainly encounter customer problems with these systems and a basic knowledge of them will help in troubleshooting.

Directions: Review Student Supplement 3, then read the following questions and answer each on the blanks provided.

Scenario 1

A customer is replacing the top radiator hose on her light duty pickup truck. As a parts specialist who knows something about cooling systems, what other parts might you suggest she consider buying?

a. ____

b. ____

Scenario 2

Another customer calls and complains of wet carpeting in the front seat of his car and the inability of his defroster to clear the windshield. What component of the heater system would you immediately suspect?

a. ____

Given the wet carpeting, what else would you suggest the man check?

b. ____

Assignment Sheet 3

Scenario 3

It's cold outside and your neighbor's older car has been sitting in the driveway for about an hour "warming up" when you hear an intermittent loud hissing sound and see steam rising up from beneath the car hood. What is the probable cause of this?

a. ____

If the noise were not intermittent and there were great volumes of steam, what should you suspect?

b. ____

Scenario 4

A customer tells you his car runs fine but the heater just doesn't get warm. What are three things you would suggest he check?

a. ____

b. ____

c. ____

Scenario 5

Why would you advise a customer not to use plain water in the car radiator, even though it is summer time and there is no chance of the radiator freezing?

____

Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 4—Analyze Situations to Determine Exhaust System Problems

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	____
Answers show cognitive grasp of student-supplement information	____

Introduction: Exhaust problems can be annoying as well as dangerous. In addition, they can cause a vehicle to exceed air quality emission standards. A basic knowledge of exhaust systems and their weak points will be of valuable use to a parts specialist.

Directions: Review Student Supplement 4, then read the following questions and answer each on the blanks provided.

Scenario 1

A friend of yours has an older car with a rusted out muffler. "I just like the sound of it," he explains, when you suggest he might replace the muffler with a new one. Why is it unwise to continue to operate this vehicle without repairing the exhaust system?

____

Scenario 2

A customer wants to buy a new muffler and it needs to be about 28 inches long and can be no more than eight inches in diameter with two-inch inlets and outlets. What is necessary to be absolutely certain the exhaust system components you are selling should fit the car in question?

____

Assignment Sheet 4

Scenario 3

A cousin of yours recently purchased a late 1980s Camaro with a small-block V8 and four-speed transmission. She says it runs better on leaded regular fuel. What will be damaged if she continues to use leaded fuel in this automobile?

____

Scenario 4

What are two functional reasons an exhaust system should be maintained in proper working condition?

a. ____

b. ____

Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 5—Analyze Situations to Determine Battery and Charging System Problems

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers show cognitive grasp of student-supplement information	______

Introduction: The battery is the heart of any vehicle's electrical system. Knowing some troubleshooting tips will help any parts specialist function better in dealing with customer problems.

Directions: Review Student Supplement 5, then read the following questions and answer each on the blanks provided.

Scenario 1

At church one day, you spot a friend trying to start her car. The starter solenoid makes a clattering ratcheting sound and the engine will not "turn over." What two items would you suspect as possible causes of the problem?

a. ______________________________

b. ______________________________

Scenario 2

A customer says the battery in his car is weak, and barely started the engine on the trip to your store. You inspect the battery and find it is very low on electrolyte, with the battery plates showing when you look through the vent cap holes. What does this battery need?

a. ______________________________

What else may be wrong to have caused this situation?

b. ______________________________

Assignment Sheet 5

Scenario 3

Your three-year old car started fine this morning, but the starter seemed a little slow. Also you've noticed the headlights brighten considerably when you race the engine. You're certain the alternator is working properly, so what could be the problem?

____

Scenario 4

In selling a replacement battery to a customer, what is the first consideration about selecting a replacement?

a. ______________________________________

What is the other consideration?

b. ______________________________________

Scenario 5

A customer had complained of a "weak" or dying battery, when in fact the starter motor on the vehicle was "dragging" because of worn out bearings. The battery itself is capable of holding a charge, but because of the extreme load of turning the worn starter motor it was in a continual state of discharge. What would you suggest to the customer as the best way to repair the starter motor?

____

Scenario 6

A customer says he needs an alternator for his 1957 Ford F100 pickup truck, and asks if you have one in stock. What should be your first reaction?

____

Scenario 7

What can cause a perfectly good battery to act as if it is "dead" or "dying?"

____

Automotive Parts and Systems Identification
Unit 6

Assignment Sheet 6—Answer Questions Related to Brake Systems

Name ______________________ Overall Rating ____________

Evaluation criteria	Rating
Directions have been followed	______
Answers show cognitive grasp of student-supplement information	______

Introduction: Brakes on today's autos and light trucks are extremely important to the safety of everyone. They operate at high temperatures and get a minimum of care, therefore it is imperative that any work done on a brake system be accomplished with the utmost care. As a parts specialist it is your responsibility to see that the correct parts are used in any brake renovation job.

Directions: Review Student Supplement 6, then read the following questions and answer each on the blanks provided.

Scenario 1

You are the instructor of a basic automotive systems class. What two types of brake systems would you introduce to the class?

a. ______________________________

b. ______________________________

Scenario 2

Give three reasons why disc brakes are better suited to today's automobiles than other types of brakes.

a. ______________________________

b. ______________________________

c. ______________________________

Assignment Sheet 6

Scenario 3

During a weekend brake job on a friend's car you find it is time to add brake fluid to the system and clean up. What should be of prime consideration in selecting brake fluid to finish this job?

a. ______________________________

Once you have selected the proper brake fluid, your friend asks you what is the difference in the fluids available. You tell him it mainly deals with the fluids' ability to operate in the presence of what?

b. ______________________________

Scenario 4

A customer has ruined a front disc brake rotor when grit found its way on to the brake pads and ground grooves into the rotor surface. Why do you suggest that the customer have both front rotors resurfaced and brake pads replaced on both front wheels?

____

Scenario 5

What two friction materials are used for brake shoe and pad linings?

a. ______________________________

b. ______________________________

Small Engine Parts and Systems
Unit 7

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify small engine parts and systems and solve problems related to the operation and maintenance of small engines. The student should demonstrate these competencies by completing the assignment sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms associated with small engines to their correct definitions.
2. Select true statements concerning the operation of a four-stroke cycle engine.
3. Identify the parts of a typical four-stroke cycle engine.
4. Select true statements concerning the operation of a two-stroke cycle engine.
5. Identify the parts of a typical two-stroke cycle engine.
6. Describe the types of fuel systems found on small engines.
7. Match basic components of a typical small engine fuel system with their functions.
8. Select true statements concerning maintenance requirements for fuel systems.
9. Describe the types of cooling systems found on small engines.
10. List two maintenance requirements for cooling systems.
11. Describe the types of ignition systems found on small engines.
12. Identify components of a typical magneto ignition system.
13. Identify components of a typical battery ignition system.
14. Select true statements concerning maintenance requirements for ignition systems.
15. Solve problems related to the operation and maintenance of small engines. (Assignment Sheet 1)

Small Engine Parts and Systems
Unit 7

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Also note suggested resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit.

- Select teacher components (teacher supplements, written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

- Obtain an example of a four-stroke small engine and a two-stroke small engine to partially disassemble for demonstration purposes to the class during study of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms associated with small engines to their correct definitions.

- Read and discuss the terms and definitions, using transparency masters and examples of engines. **(Reading/listening for content; applying technical terms)**
- Read and discuss Teacher Supplement 1 with the class to illustrate the impact small engines have on current everyday life in this country. Have class members list the number of small engines in use or available for use at their household. **(Listening for content; oral communication)**

Objective 2 Select true statements concerning the operation of a four-stroke cycle engine.

- Using Transparency 1, lead the class in a discussion of the operating principles of a four-stroke engine, emphasizing the importance of interrelated parts within the engine which allow correct valve timing and ignition pulses. **(Listening for content; applying technical terms; adapting to the organization's traditional modes of operation)**
- Distribute Student Supplement 1. Instruct students to read the supplement and then participate in a class discussion of information presented. Have students compare four-stroke and two-stroke engines. **(Reading/listening for content; oral communication; applying technical terms)**
- Use four-stroke engine (without the cylinder head) to demonstrate valve timing in relation to piston position within the cylinder. **(Listening for content)**

Objective 3 Identify the parts of a typical four-stroke cycle engine.

- Using Transparency 2, lead the class in a discussion of the various parts of a four-stroke engine. **(Reading/listening for content; applying technical terms)**
- Use four-stroke engine (disassemble as required) to demonstrate parts and their relationships. Allow class members to observe parts working with one another. **(Listening for content; applying knowledge learned to specific task)**

Suggested Activities

Objective 4 Select true statements concerning the operation of a two-stroke cycle engine.

- Using Transparency 3, lead the class in a discussion of the operating principles of a two-stroke engine, emphasizing the importance of interrelated parts within the engine which allow fuel intake, exhaust, and ignition pulses. **(Listening for content; applying technical terms; adapting to the organization's traditional modes of operation)**

- Use two-stroke engine (without carburetor) to demonstrate reed valve timing in relation to piston position within the cylinder. **(Listening for content)**

Objective 5 Identify the parts of a typical two-stroke cycle engine.

- Using Transparency 4, lead the class in a discussion of the various parts of a two-stroke engine. **(Reading/listening for content; applying technical terms)**

- Use two-stroke engine (disassemble as required) to demonstrate parts and their relationships. Allow class members to observe parts working with one another. **(Listening for content; applying knowledge learned to specific task)**

Objective 6 Describe the types of fuel systems found on small engines. **Objective 7** Match components of a typical small engine fuel system with their functions.

- Using Transparency 5, lead the class in a discussion of the basic components of a small engine fuel system and their functions. **(Reading/listening for content; applying technical terms)**

Objective 8 Select true statements concerning maintenance requirements for fuel systems.

- Distribute Student Supplement 2. Instruct students to read the supplement and participate in a class discussion of material found there. Ask for class members to discuss personal experience with improper maintenance of fuel systems of small engines. **(Reading/listening for content; applying technical terms; oral communication; adapting to the organization's traditional modes of operation)**

Suggested Activities

- Use engines to show the various parts in a typical fuel system. **(Listening for content)**

Objective 9 Describe the types of cooling systems found on small engines. **Objective 10** List two maintenance requirements for cooling systems.

- Distribute Student Supplement 3. Instruct students to read the supplement and participate in a class discussion of material found there. Ask for class members to discuss personal experience with improper maintenance of cooling systems of small engines. **(Reading/listening for content; applying technical terms; oral communication; adapting to the organization's traditional modes of operation)**

- Use engines to show the various parts in a typical cooling system. **(Listening for content)**

Objective 11 Describe the types of ignition systems found on small engines. **Objective 12** Identify components of a typical magneto ignition system.

- Using Transparency 6, lead the class in a discussion of the components of a typical magneto ignition system. **(Reading/listening for content; applying technical terms)**

Objective 13 Identify components of a typical battery ignition system.

- Using Transparency 7, lead the class in a discussion of the components of a typical battery ignition system. **(Reading/listening for content; applying technical terms)**

Objective 14 Select true statements concerning maintenance requirements for ignition systems.

- Distribute Student Supplements 4 and 5. Instruct students to read the supplements and participate in a class discussion of material found there. Ask for class members to discuss personal experience with various types of ignition systems discussed here. **(Reading/listening for content; applying technical terms; oral communication; adapting to the organization's traditional modes of operation)**

Suggested Activities

- Hand out Assignment Sheet 1, "Solve Problems Related to the Operation and Maintenance of Small Engines." Read and discuss the evaluation criteria and directions, then have students complete the assignment. **(Problem solving; communicating a thought or idea in written form in a clear, concise manner; listening for directions)**

Evaluation

- Evaluate assignment sheet. See the evaluation criteria listed at the top of the assignment sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores. See the teacher page "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- Crouse, William H., and Donald. Anglin. *Small Engine Mechanics*, 2nd ed. New York, NY: McGraw-Hill Book Co., 1980.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management*. Albany, NY: Delmar Publishers, Inc., 1989.
- *Small Engines Service Manual*, 10th ed. Kansas City, MO: Intertec Publishing Corp.

Suggested Supplemental Resources

The following audio visual materials are available from the Briggs & Stratton Corp. as part of its Educational Program. For current prices and availability contact Briggs & Stratton Corp., P.O. Box 702, Milwaukee, WI 53201.

- The Straight Facts about Gasoline & Lubricants, (31 slides)
- Checking Carburetor Systems, (16 slides)
- Checking Ignition Systems, (29 slides)
- Engine Analysis, (48 slides)
- Briggs & Stratton History, (94 slides)

Suggested Activities

- Briggs & Stratton Plant Tour (134 slides)
- Complete the Sale (79 slides)
- Maximizing Engine Life Through Preventive Maintenance (35 min. VHS Videocassette)

Small Engine Parts and Systems
Unit 7

Answers to Assignment Sheet 1

1. The mower is equipped with a two-stroke engine, therefore it does not require regular oil changes but a specific fuel/oil mixture recommended by the manufacturer. The parts specialist should offer to look up the fuel/oil ratio or recommend a local dealer of Toro equipment who could determine what fuel/oil ratio mixture is needed for the engine.

2. Because of their simplicity in design, they are very lightweight for the power they produce. Light weights are desirable in hand-held equipment.

3. Keep the fuel tank full of fresh gasoline, preferably treated with an anti-oxidant to prevent fuel from forming varnishes in the fuel system. If fuel treatments are out of the question, the carburetor of the equipment should be run "dry" before winter storage.

4. Other than neighbors complaining about the noise, this individual is inviting early engine failure by operating it in a very dirty environment without an air cleaner. Such a practice can ruin an engine in only a few operating hours.

5. This engine has overheated because of dust and straw blocking the forced-draft cooling system. In addition, the dust on the engine acts as an insulating layer to prevent the natural flow of excess engine heat to the forced air stream flowing through the cooling fins.

6. This problem usually can be traced to breaker points which are set too wide. Such a condition actually changes the timing of an engine to the point it can backfire and or "pre-ignite" causing the engine to attempt to turn backwards.

7. Burned points can be caused by setting the breaker points too close, where they are the victims of arcing. Also, a failing condenser can cause points to "burn," as these obviously are doing.

8. A primary test to troubleshoot this engine would be the "spark test" in which you would disconnect the spark plug lead, remove the spark plug, hold the lead near the engine's cylinder head and crank the engine to see if an ignition spark jumps from the lead to the engine. If it does not, or if it is very weak and intermittent, problems are present in the ignition system.

9. This engine is obviously wet from the garden hose treatment. Thoroughly drying the spark plug lead and rubber boot which fits over the plug's end, and drying the spark plug itself, should cure the problem. If not, water has entered the flywheel housing and probably is causing a failure of the ignition system by wetting the air-gap between the magnets and the ignition coil. Also, it isn't likely, but water could have entered the breaker point chamber and caused a short circuit there. In these cases, the engine will have to be disassembled to dry the components, or allowed to air dry several hours until the ignition system will again operate.

Small Engine Parts and Systems
Unit 7

Answers to Written Test

1. a. 8
   b. 1
   c. 6
   d. 2
   e. 7
   f. 3
   g. 5
   h. 4

2. a. 2
   b. 2
   c. 1, 2
   d. 2

3. a. Crankshaft oil seal
   b. Crankcase cover
   c. Gasket
   d. Thrust washer
   e. Governor assembly
   f. Camshaft and drive gear
   g. Tappets (cam followers or valve lifters)
   h. Crankshaft
   i. Connecting screw link
   j. Oil dipper
   k. Connecting rod
   l. Piston
   m. Piston rings
   n. Cylinder head
   o. Spark plug ground switch
   p. Cylinder head cover
   q. Head gasket
   r. Wrist pin retainers
   s. Wrist pin
   t. Cylinder shield
   u. Exhaust valve
   v. Intake valve
   w. Valve spring retainers
   x. Cylinder block
   y. Muffler
   z. Valve springs
   aa. Gasket-valve cover
   bb. Breather and tappet chamber cover
   cc. Breather tube
   dd. Governor lever
   ee. Clamping bolt
   ff. Governor crank

4. b, d, e, f

Answers to Written Test

5. a. Engine base (side of crankcase)
   b. Gasket
   c. Crankcase seal
   d. Crankshaft bearings
   e. Crankshaft
   f. Rod cap
   g. Rod bearings and cage
   h. Connecting rod
   i. Piston
   j. Wrist pin
   k. Clip
   l. Piston rings
   m. Crankcase
   n. Head gasket
   o. Cylinder head
   p. Spark plug
   q. Magneto backplate (side of crankcase)

6. a. Gravity feed—Fuel flows from fuel tank through a fuel line and filter to the carburetor.
   b. Suction feed—Fuel is drawn from fuel tank by intake vacuum to the carburetor.
   c. Pressure feed—Fuel is pumped from a remote fuel tank by a pump and supplied under pressure to the carburetor.

7. a. 7
   b. 4
   c. 5
   d. 6
   e. 2
   f. 3
   g. 1

8. b, c

9. a. Open draft—A system in which cooling fins provide a large surface area from which to dissipate waste engine heat in the air stream flowing past the engine
   b. Forced draft—A system in which cooling air is forced by fan through a series of shrouds and baffles around the cooling fins at an engine regardless of air movement around the engine itself

10. In either order:

   a. Keep engine in clean condition.
   b. Maintain baffles and shrouds in good working condition.

Answers to Written Test

11. a. Flywheel magneto—Built into a small engine using magnets mounted on the engine's flywheel to induce small primary ignition circuit current
    b. External magneto—Mounted to the outside of a small engine, driven by the crankshaft or camshaft, which uses rotating permanent magnets to induce small primary ignition circuit current
    c. Battery-ignition system—Uses a lead-acid storage battery for the primary ignition circuit

12. a. Permanent magnets
    b. Transformer coil
    c. Breaker points and condenser (or solid state ignition module)
    d. High voltage spark plug lead
    e. Spark plug

13. a. Battery
    b. Ignition switch
    c. Ignition coil
    d. Breaker points and condenser (or solid state ignition module)
    e. High voltage spark plug lead
    f. Spark plug

14. c, d, e, g

Small Engine Parts and Systems
Unit 7

Written Test

Name ______________________________ Score ______________

1. Match terms associated with small engines with their correct definitions. Write the numbers on the blanks provided below.

______a. An engine in which the crankshaft is mounted in a vertical position

______b. A set of electrical contacts which serve as a switch for primary current in both magneto and battery-ignition systems

______c. An ignition system which uses electronic components such as diodes and transistors, instead of breaker points, to control its primary current

______d. A device which uses vacuum produced during an engine's intake stroke to draw fuel and air together and mix them in proper proportions for combustion within the engine

______e. A design of internal combustion engine which completes a complete power, exhaust, compression and intake cycle in two piston strokes (or one revolution of the crankshaft)

______f. A design of internal combustion engine which completes a complete power, exhaust, compression and intake cycle in four piston strokes (or two revolutions of the crankshaft)

______g. A mechanical device which uses moving magnets to induce electrical current in a stationary coil of a transformer, thereby creating a high voltage spark for engine ignition

______h. An engine in which the crankshaft is mounted in a horizontal position

1. Breaker points
2. Carburetor
3. Four-stroke cycle engine
4. Horizontal shaft engine
5. Magneto
6. Solid state ignition
7. Two-stroke cycle engine
8. Vertical shaft engine

Written Test

2. Select true statements concerning the operation of a four-stroke cycle engine by placing an "X" in the appropriate blanks.

   a. Intake stroke

      ______(1) Cycle starts with piston at uppermost position in cylinder (TDC) with intake valve closed and exhaust valve open

      ______(2) As the piston moves down the cylinder, it draws air-fuel mixture into the cylinder from the carburetor

      ______(3) When the piston reaches the bottom of the cylinder (BDC), the exhaust valve closes

   b. Compression stroke

      ______(1) Air-fuel mixture is compressed tightly as the piston moves down the cylinder

      ______(2) Compression of the fuel creates heat.which prepares the fuel for instant ignition

   c. Power stroke

      ______(1) As the piston reaches the top of the cylinder on compression stroke,a spark from the ignition system ignites the air-fuel mixture

      ______(2) Burning gases expand very rapidly and force the piston down the cylinder

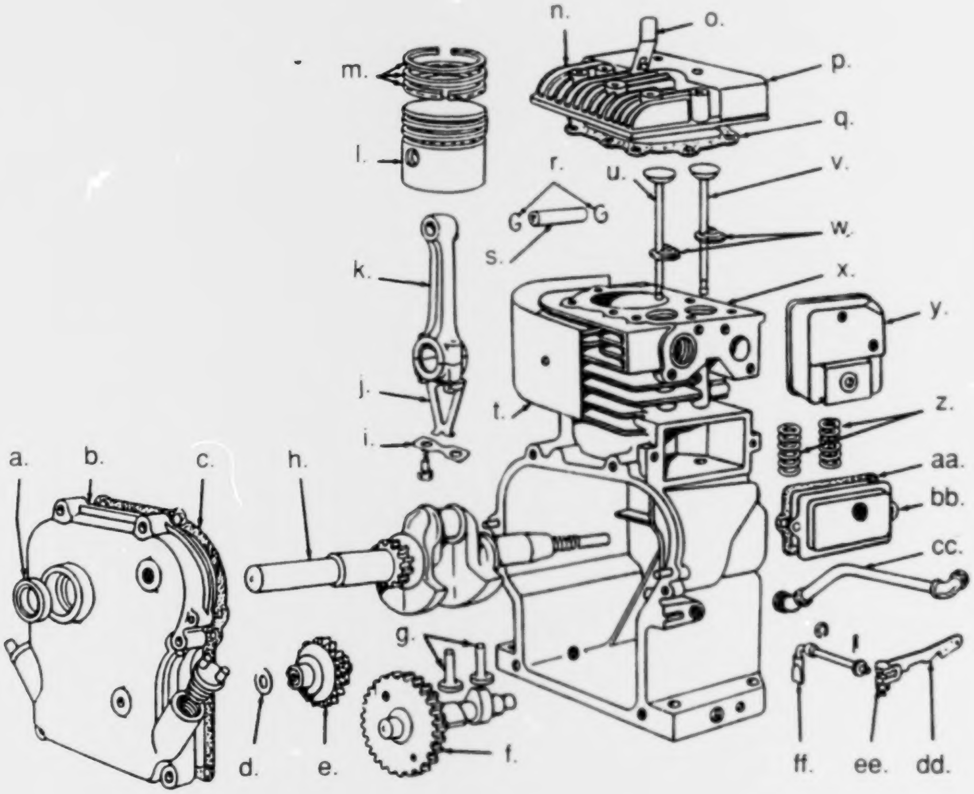
   d. Exhaust stroke

      ______(1) As the piston reaches the top of the cylinder on power stroke, the exhaust valve closes

      ______(2) Piston travels up the cylinder, forcing the burned gases out of the cylinder into the exhaust manifold

Written Test

3. Identify the parts of a typical four-stroke cycle engine. Place the part names on the corresponding blanks.


n.
o.
p.
m.
q.
l.
r.
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v.
w.
s.
k.
x.
y.
j.
t.
z.
i.
a.
b.
c.
h.
aa.
bb.
cc.
g.
d.
e.
f.
ff.
ee.
dd.

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a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

g. ______________________

h. ______________________

Written Test

i. ______________________________

j. ______________________________

k. ______________________________

l. ______________________________

m. ______________________________

n. ______________________________

o. ______________________________

p. ______________________________

q. ______________________________

r. ______________________________

s. ______________________________

t. ______________________________

u. ______________________________

v. ______________________________

w. ______________________________

x. ______________________________

y. ______________________________

z. ______________________________

aa. ______________________________

bb. ______________________________

cc. ______________________________

dd. ______________________________

ee. ______________________________

ff. ______________________________

4. Select true statements concerning the operation of a two-stroke cycle engine by placing an "X" in the appropriate blanks.

______a. Piston moves down cylinder drawing fuel-air mixture into crankcase.

______b. Piston moves down cylinder, pressurizing mixture in crankcase.

______c. Piston moves past transfer port allowing pressurized mixture to move into crankcase.

______d. Piston moves up in cylinder again and draws more fuel-air mixture into crankcase.

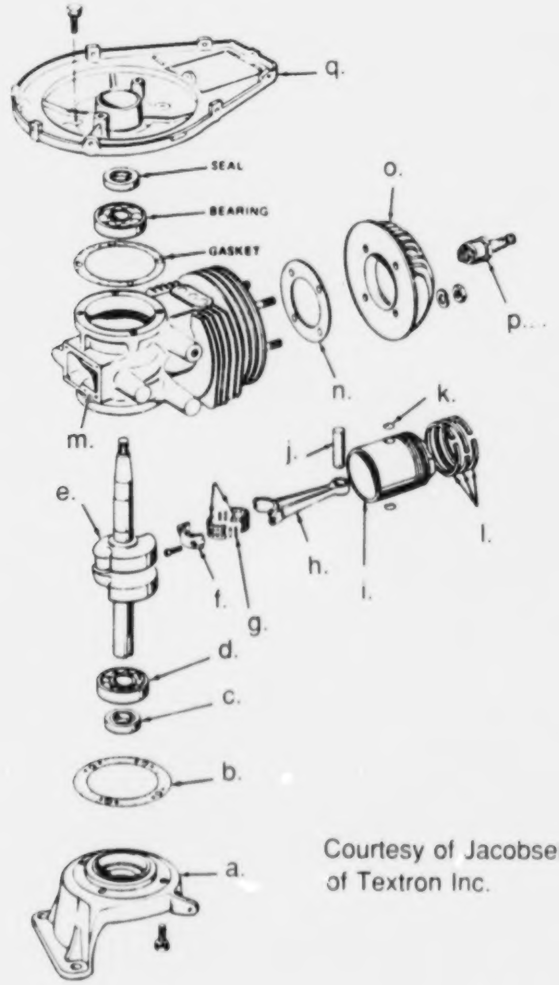
______e. Spark plug fires compressed mixture.

______f. Combustion moves piston back down cylinder.

______g. Piston starts back up cylinder closing transfer port and opening exhaust port.

Written Test

5. Identify the parts of a typical two-stroke cycle engine.


q.
SEAL
BEARING
GASKET
o.
p.
n.
k.
m.
j.
e.
l.
h.
f.
i.
g.
d.
c.
b.
a.

Courtesy of Jacobsen Division of Textron Inc.

a. ______________________ e. ______________________

b. ______________________ f. ______________________

c. ______________________ g. ______________________

d. ______________________ h. ______________________

Written Test

i. ____________________

j. ____________________

k. ____________________

l. ____________________

m. ____________________

n. ____________________

o. ____________________

p. ____________________

q. ____________________

6. Describe the types of fuel systems found on small engines.

   a. Gravity feed — ____

   b. Suction feed — ____

   c. Pressure feed — ____

Written Test

7. Match basic components of a typical small engine fuel system with their functions. Write the numbers on the blanks provided below.

______a. Hold fuel supply without spilling or leaking fumes

______b. Delivers fuel to carburetor during engine operation

______c. Filters rust, dirt and other impurities from gasoline before it reaches carburetor (optional but highly recommended)

______d. Forces up the fuel from the fuel tank to the carburetor during engine operation

______e. Mixes intake air and raw fuel in proportions suitable for proper combustion (roughly 17:1 under normal conditions)

______f. Limits the amount of intake air allowed into the carburetor, thus enriching the fuel mixture for easier cold starting

______g. Traps dirt, dust, and other debris from intake air stream before it enters and clogs the carburetor

1. Air cleaner
2. Carburetor with choke assembly
3. Choke device
4. Fuel delivery line
5. Fuel filter
6. Fuel pump
7. Fuel tank and cap

8. Select true statements concerning maintenance requirements for fuel systems by placing an "X" in the appropriate blanks.

______a. Maintain full fuel supply in cold weather and limited fuel supply in warm weather to prevent water condensation contamination in fuel and rust in tank.

______b. Keep fuel lines and fittings tight and in good repair to prevent leakage and potential fires.

______c. Keep fuel supply fresh, or treated with anti-oxidants to prevent the formation of gums and varnishes which clog carburetors and cause difficult starting.

______d. Maintain fuel and air filters to prevent contamination of fuel tank from rust, dirt, and other debris which could come from fuel or air.

Written Test

9. Describe the types of cooling systems found on small engines.

   a. Open draft —

   b. Forced draft —

10. List two maintenance requirements for cooling systems.

    a.

    b.

11. Describe the types of ignition systems found on small engines.

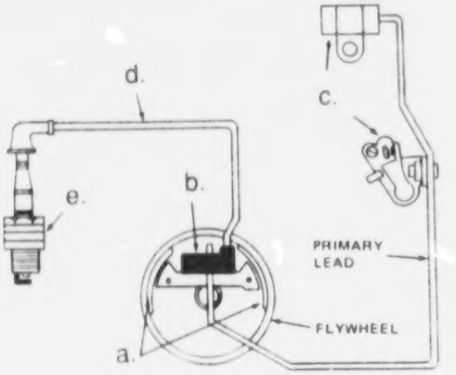
    a. Flywheel magneto —

    b. External magneto —

    c. Battery ignition system —

Written Test

12. Identify the components of a magneto ignition system. Place the component names on the corresponding blanks.


d.
c.
b.
e.
PRIMARY LEAD
FLYWHEEL
a.

Courtesy of Kohler Co.

a. ______________________

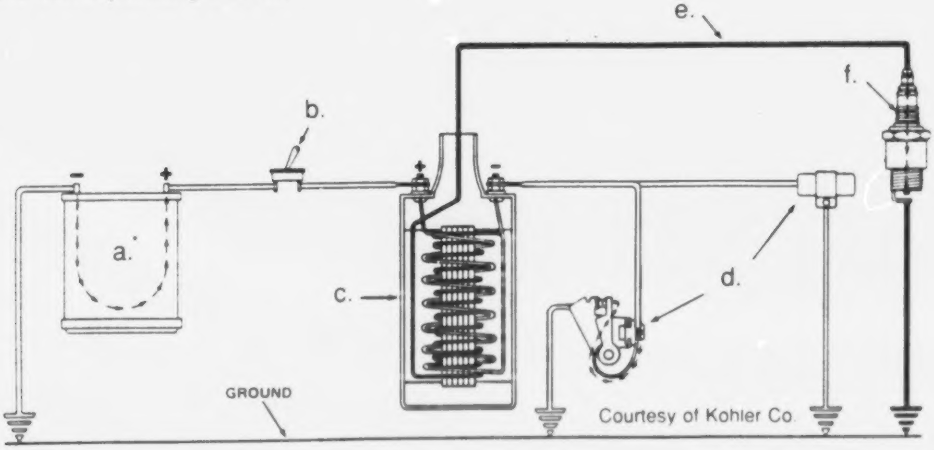
b. ______________________

c. ______________________

d. ______________________

e. ______________________

13. Identify the components of a battery ignition system. Place the component names on the corresponding blanks.


e.
f.
b.
−
+
a.
+
−
c.
d.
GROUND

Courtesy of Kohler Co.

a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

f. ______________________

Written Test

14. Select the true statements concerning maintenance requirements for ignition systems maintenance by placing an "X" in the appropriate blanks.

_______a. Spark plugs are a universal part which will function well as long as they will screw into the spark plug hole in the engine head.

_______b. Spark plugs are gapped correctly at the factory for the engines for which they are designed.

_______c. Breaker points must be properly lubricated for satisfactory service life.

_______d. A parts specialist should be aware of spark plug heat ranges.

_______e. Breaker points must be correctly gapped as they are installed in an engine for proper engine performance.

_______f. Because solid state ignition systems require no breaker points or condensers, a parts specialist need not bother with knowledge of such parts.

_______g. Insulation on high tension spark plug leads must not be oil soaked or cracked.

***Permission to duplicate this test is granted.**

Small Engine Parts and Systems
Unit 7

Unit Evaluation Form

Student Name ______________________ Unit Rating ________

Assignment Sheet 1—Solve Problems Related to the Operation and Maintenance of Small Engines Rating ____

Comments: ______________________

____

Written-Test Scores

Pretest ____ Posttest ____ Other ____

Other ______________________

____

Teacher Signature ______________________ Date ________

Student Signature ______________________ Date ________

***Permission to duplicate this form is granted.**

Small Engine Parts and Systems
Unit 7

Teacher Supplement 1—Small Engines and Everyday Life

Although small, lightweight gasoline engines began revolutionizing farm and military equipment throughout the early part of the 20th Century, it was only after World War II that small air-cooled engines became fully ingrained into the American way of life.

Using metallurgical technology developed during the war, U.S. manufacturers moved to lightweight aluminum alloys—replacing the predominate use of heavier cast iron—to cast the cylinder blocks of millions of power plants used on power mowers, construction equipment, boat motors, generators, chain saws and a host of equipment in demand by the thriving post-war economy. As society began to accept this portable, "on-demand" power as normal, even more uses for small engines began to develop.

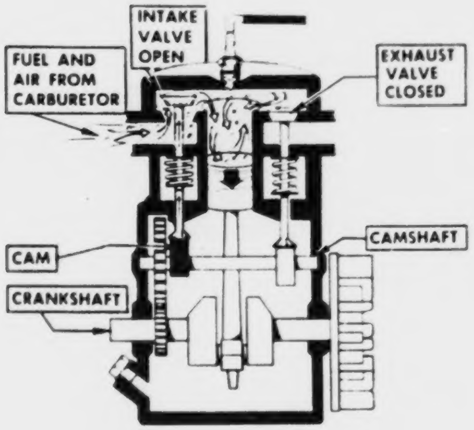
Today, small, highly efficient gasoline engines power pumps, camping generators, weed and hedge trimmers, sprayers, snow blowers, lawn mowers, leaf blowers, lawn and garden equipment, log splitters, construction equipment, stationary farm equipment, portable refrigeration units, boats, go-karts, jet skis, snowmobiles, motorcycles, compressors and just about anything else that needs a portable, dependable, self-contained power plant.

Today, air-cooled engines bearing names such as Briggs & Stratton (the world's largest manufacturer of small engines), Homelite, Honda, Kohler, OMC (Outboard Marine Corp.), Onan, and Tecumseh are found powering much of the world's outdoor equipment and small vehicles. In fact, more than 12 million of these engines (under 20 hp.) are manufactured each year in the United States alone. Japan and Europe also produce large quantities of small engines and, with increasingly enhanced international trade, these units also will be working across the U.S. landscape in the future.

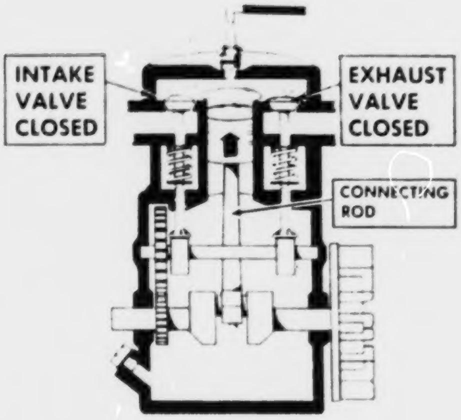
Given a conservative life span of five years and considering all applications, this gigantic engine population represents a potential market for service parts and procedures during any one year of 60 million engines.

***Permission to duplicate this supplement is granted.**

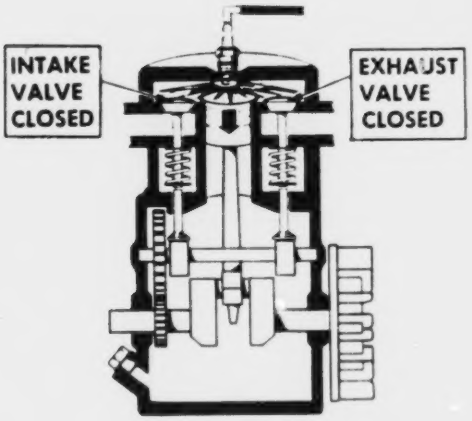
Operation of a Four-Stroke Cycle Engine


INTAKE VALVE OPEN
FUEL AND AIR FROM CARBURETOR
EXHAUST VALVE CLOSED
CAMSHAFT
CAM
CRANKSHAFT

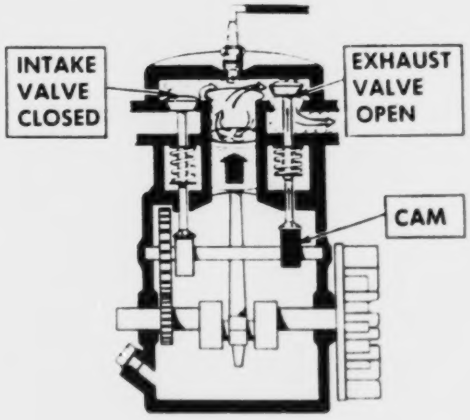
Piston Intake Stroke


INTAKE VALVE CLOSED
EXHAUST VALVE CLOSED
CONNECTING ROD

Piston Compression Stroke

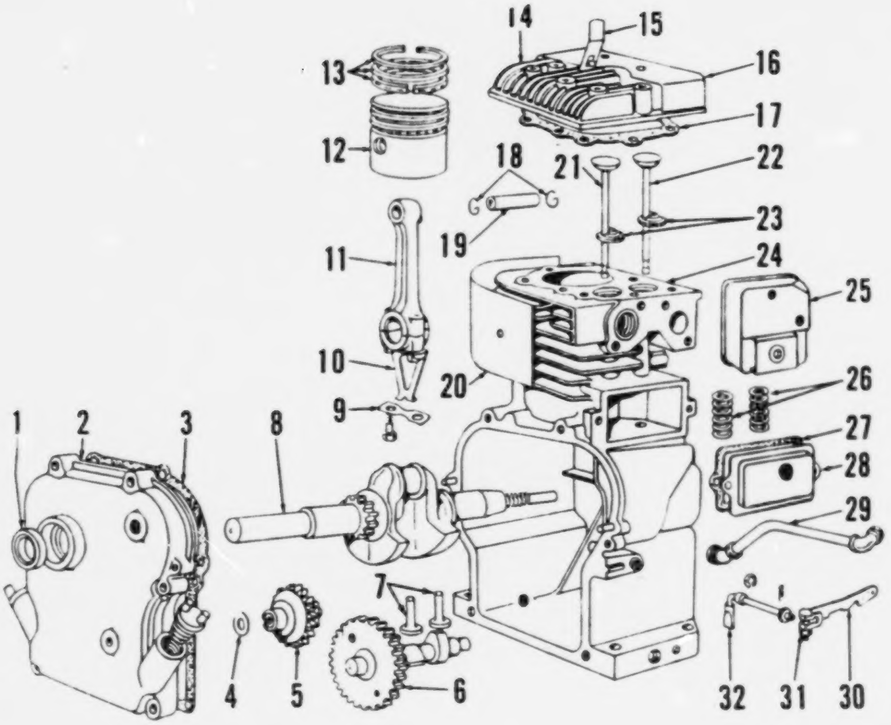

INTAKE VALVE CLOSED
EXHAUST VALVE CLOSED

Piston Power Stroke


INTAKE VALVE CLOSED
EXHAUST VALVE OPEN
CAM

Piston Exhaust Stroke

Parts of a Typical Four-Stroke Cycle Engine



1. Crankshaft oil seal
2. Crankcase cover
3. Gasket, 0.015 thick (standard)
4. Thrust washer
5. Governor assembly
6. Cam shaft and drive gear
7. Tappets (cam followers)
8. Crankshaft
9. Connecting screw link
10. Oil dipper
11. Connecting rod
12. Piston
13. Piston rings
14. Cylinder head
15. Spark plug ground switch
16. Cylinder head cover
17. Cylinder head gasket
18. Piston pin retaining rings
19. Piston pin
20. Cylinder shield
21. Exhaust valve
22. Intake valve
23. Valve spring retainers
24. Cylinder block
25. Muffler
26. Valve springs
27. Gasket-valve cover
28. Breather & tappet chamber cover
29. Breather tube
30. Governor lever
31. Clamping bolt
32. Governor crank

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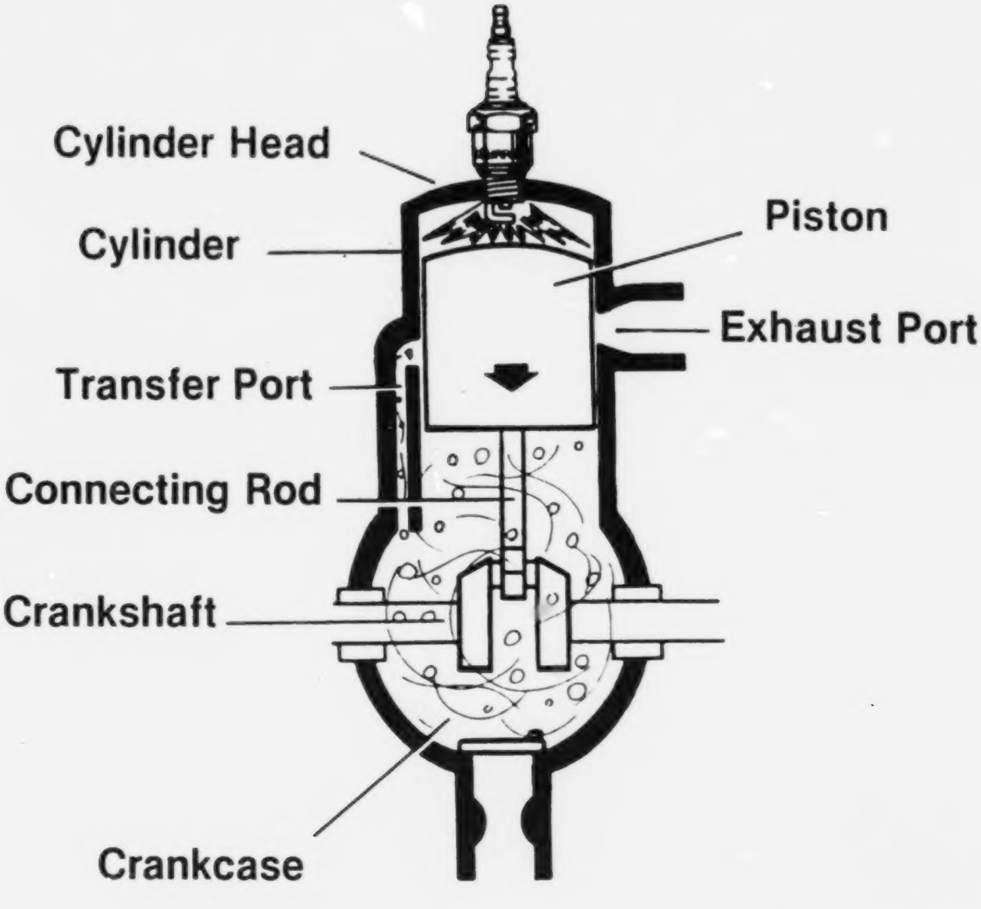
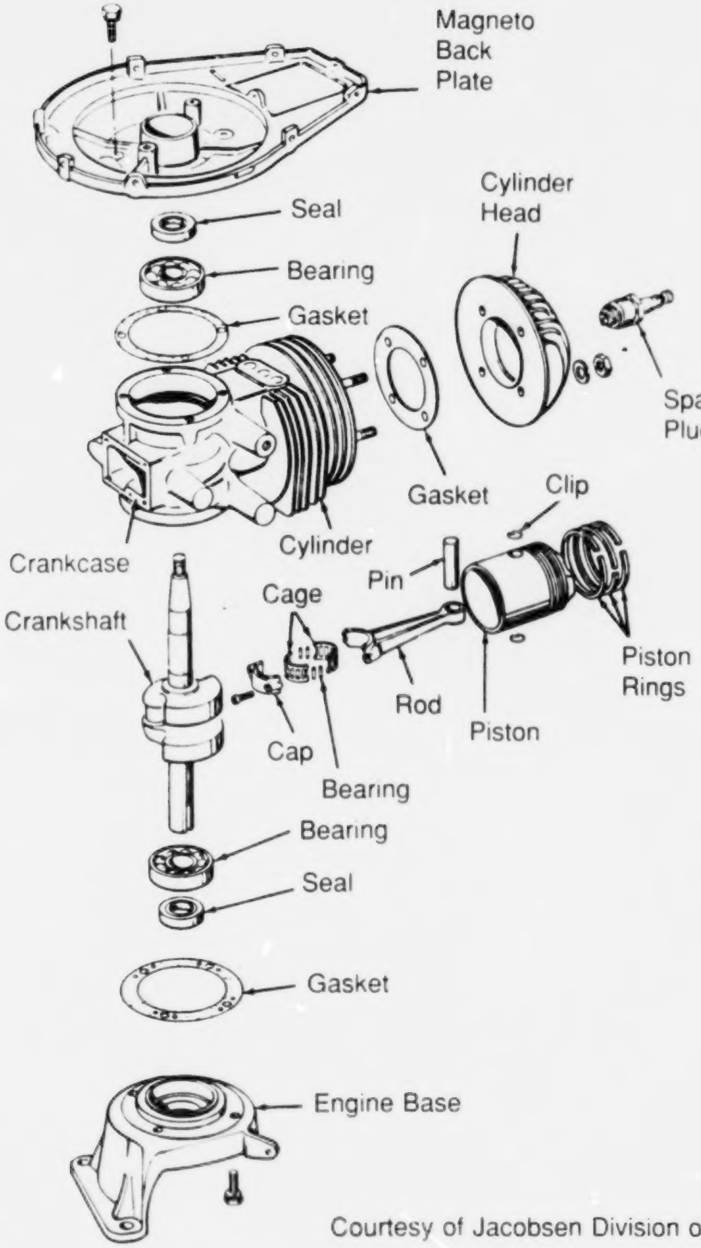
Operation of a Two-Stroke Cycle Engine

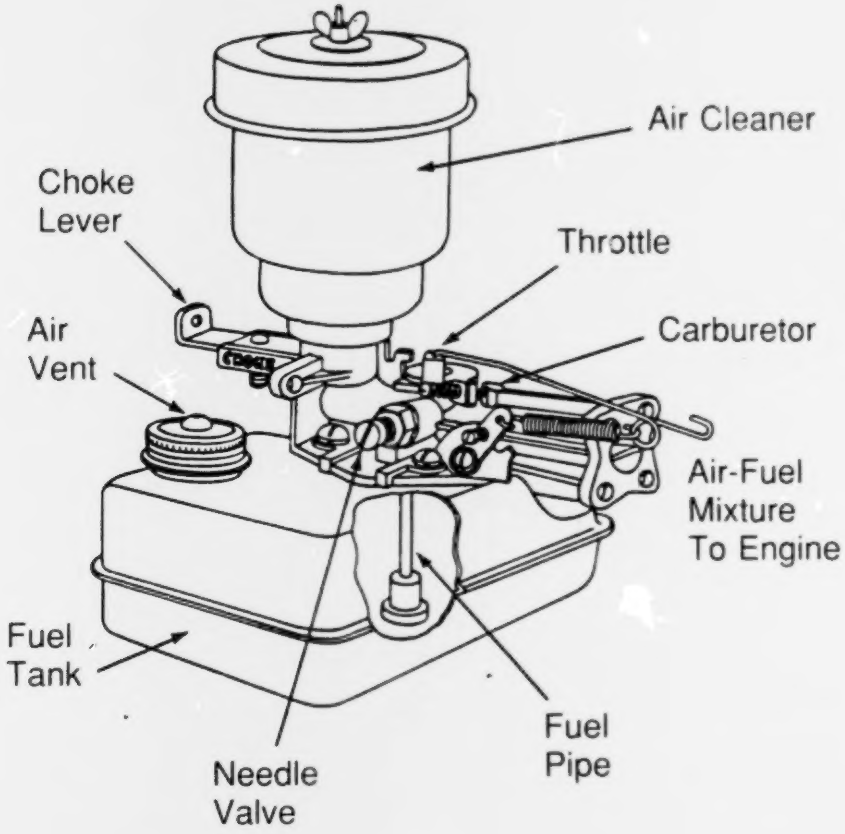

Cylinder Head
Piston
Cylinder
Exhaust Port
Transfer Port
Connecting Rod
Crankshaft
Crankcase

Parts of a Typical Two-Stroke Cycle Engine


Magneto Back Plate
Seal
Bearing
Gasket
Cylinder Head
Spark Plug
Gasket
Clip
Crankcase
Cylinder
Pin
Cage
Crankshaft
Piston Rings
Rod
Piston
Cap
Bearing
Bearing
Seal
Gasket
Engine Base

Courtesy of Jacobsen Division of Textron Inc.

Basic Components of a Typical Small Engine Fuel System


Air Cleaner
Choke Lever
Throttle
Carburetor
Air Vent
Air-Fuel Mixture To Engine
Fuel Tank
Fuel Pipe
Needle Valve

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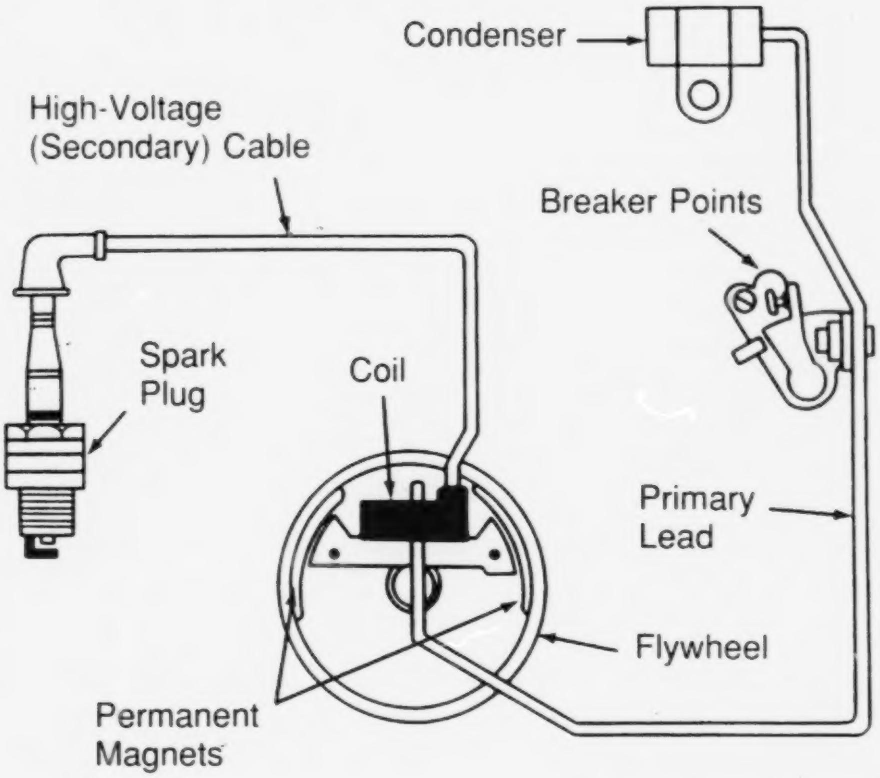
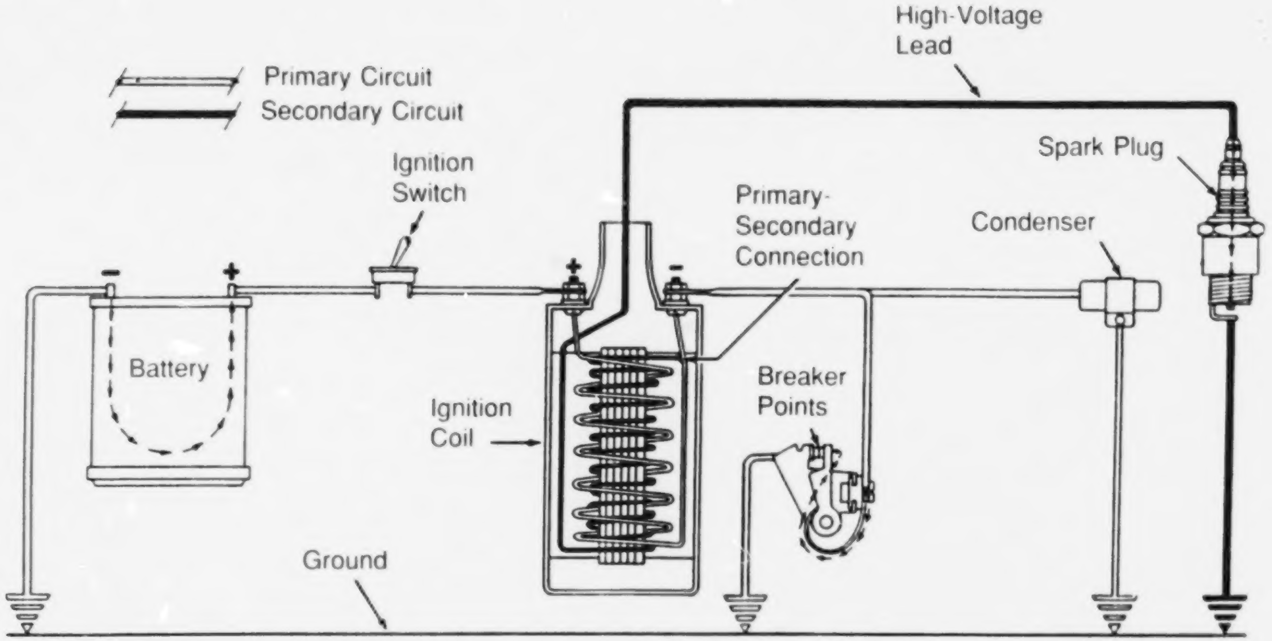
Components of a Typical Magneto Ignition System


Condenser
High-Voltage
(Secondary) Cable
Breaker Points
Spark
Plug
Coil
Primary
Lead
Flywheel
Permanent
Magnets

Courtesy of Kohler Company

Components of a Typical Battery Ignition System


Primary Circuit
Secondary Circuit
High-Voltage Lead
Spark Plug
Ignition Switch
Primary-Secondary Connection
Condenser
−
+
+
−
Battery
Ignition Coil
Breaker Points
Ground

Courtesy of Kohler Co.

Small Engine Parts and Systems
Unit 7

Information Sheet

1. **Terms and definitions associated with small engines**

    a. **Breaker points** — A set of electrical contacts which serve as a switch for primary current in both magneto and battery-ignition systems

    b. **Carburetor** — A device which uses vacuum produced during an engine's intake stroke to draw fuel and air together and mix them in proper proportions for combustion within the engine

    c. **Four-stroke cycle engine** — A design of internal combustion engine which completes a complete power, exhaust, compression and intake cycle in four piston strokes (or two revolutions of the crankshaft)

    d. **Horizontal shaft engine** — An engine in which the crankshaft is mounted in a horizontal position

    e. **Magneto** — A mechanical device which uses moving magnets to induce electrical current in a stationary coil of a transformer, thereby creating a high voltage spark for engine ignition

    f. **Solid state ignition** — An ignition system which uses electronic components such as diodes and transistors, instead of breaker points, to control its primary current

    g. **Two-stroke cycle engine** — A design of internal combustion engine which completes a complete power, exhaust, compression and intake cycle in two piston strokes (or one revolution of the crankshaft)

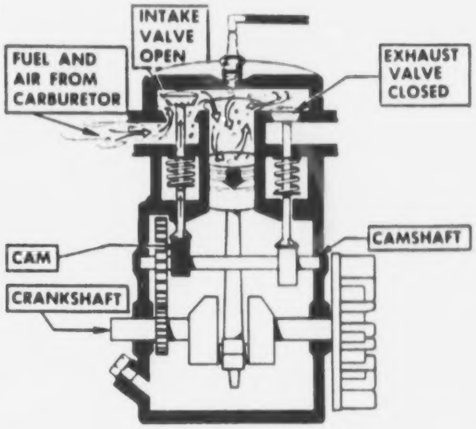
    h. **Vertical shaft engine** — An engine in which the crankshaft is mounted in a vertical position

Information Sheet

2. Operation of a four-stroke cycle engine

Note: Four-stroke refers to the number of times the piston moves up and down in the cylinder to complete one cycle of operation. Four-stroke cycle engines are commonly called four-cycle engines.

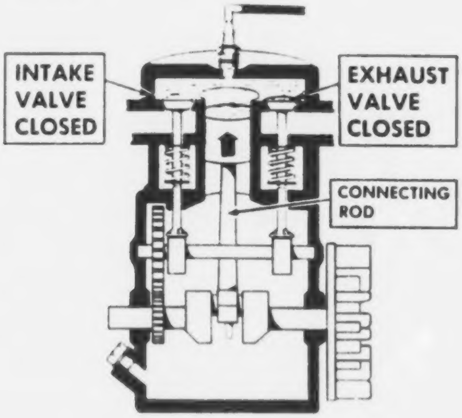
a. Intake stroke


INTAKE VALVE OPEN
FUEL AND AIR FROM CARBURETOR
EXHAUST VALVE CLOSED
CAMSHAFT
CAM
CRANKSHAFT

- Cycle starts with piston at uppermost position in cylinder (TDC) with intake valve open and exhaust valve closed.
- As the piston moves down the cylinder, it draws air-fuel mixture into the cylinder from the carburetor.
- When the piston reaches the bottom of the cylinder (BDC), the intake valve closes.

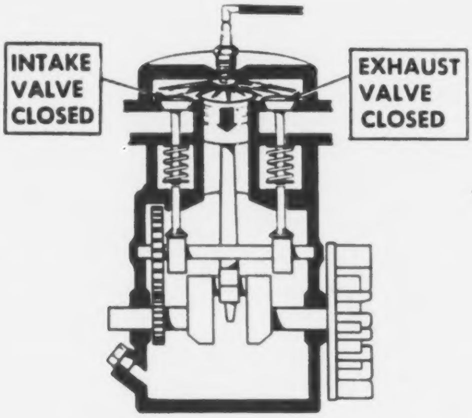
Information Sheet

b. Compression stroke


INTAKE VALVE CLOSED
EXHAUST VALVE CLOSED
CONNECTING ROD

- Air-fuel mixture is compressed tightly as the piston moves up the cylinder.
- Compression of the fuel creates heat which prepares the fuel for instant ignition.

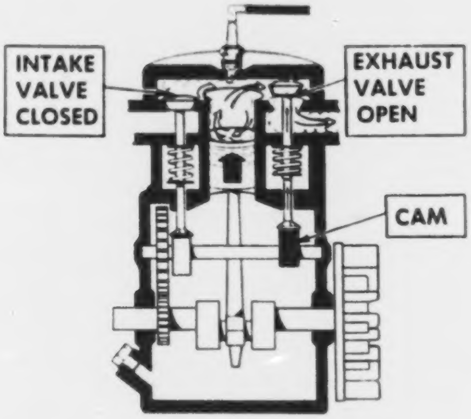
c. Power stroke


INTAKE VALVE CLOSED
EXHAUST VALVE CLOSED

- As the piston reaches the top of the cylinder on compression stroke, a spark from the ignition system ignites the air-fuel mixture.
- Burning gases expand very rapidly and force the piston down the cylinder.

Information Sheet

d. Exhaust stroke

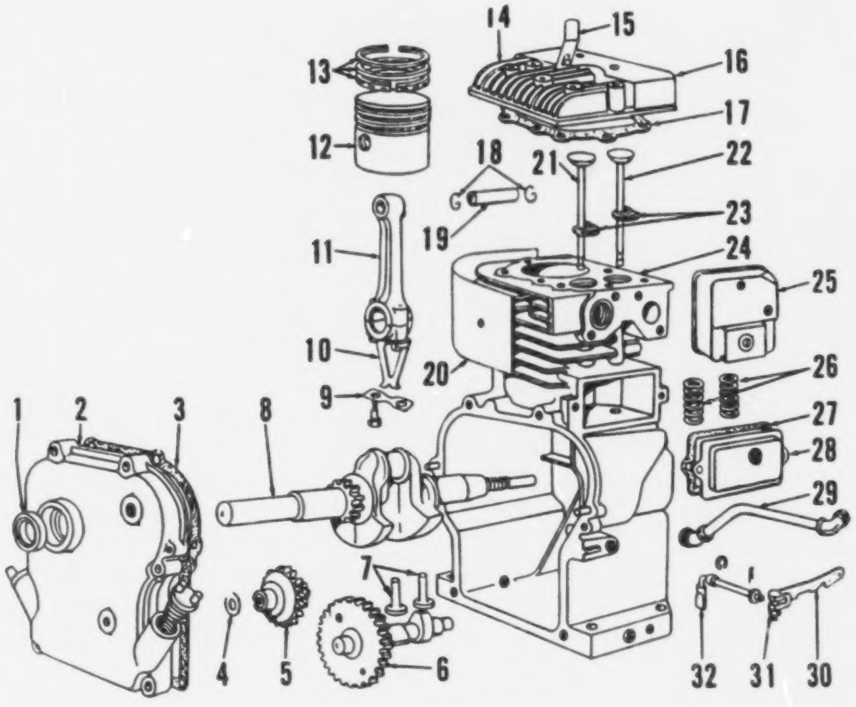

INTAKE VALVE CLOSED
EXHAUST VALVE OPEN
CAM

- As the piston reaches the bottom of the cylinder on power stroke, the exhaust valve opens.
- Piston travels up the cylinder, forcing the burned gases out of the cylinder into the exhaust manifold.

Note: The complete cycle takes two rotations of the crankshaft or 720 degrees of rotation.

Information Sheet

3. Parts of a typical four-stroke cycle engine



1. Crankshaft oil seal
2. Crankcase cover
3. Gasket, 0.015 thick (standard)
4. Thrust washer
5. Governor assembly
6. Cam shaft and drive gear
7. Tappets (cam followers)
8. Crankshaft
9. Connecting screw link
10. Oil dipper
11. Connecting rod
12. Piston
13. Piston rings
14. Cylinder head
15. Spark plug ground switch
16. Cylinder head cover
17. Cylinder head gasket
18. Piston pin retaining rings
19. Piston pin
20. Cylinder shield
21. Exhaust valve
22. Intake valve
23. Valve spring retainers
24. Cylinder block
25. Muffler
26. Valve springs
27. Gasket-valve cover
28. Breather & tappet chamber cover
29. Breather tube
30. Governor lever
31. Clamping bolt
32. Governor crank

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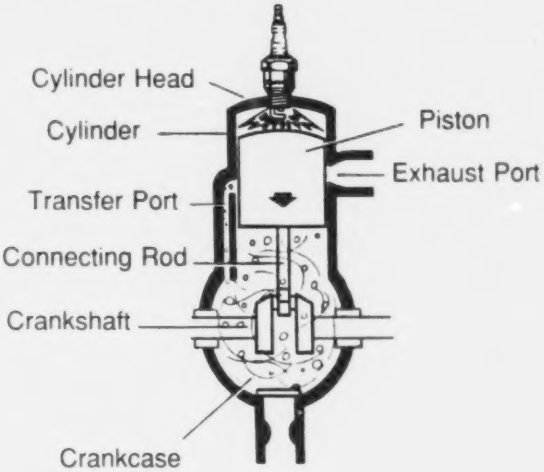
Information Sheet

4. Operation of a two-stroke cycle engine


Cylinder Head
Cylinder
Transfer Port
Connecting Rod
Crankshaft
Crankcase
Piston
Exhaust Port

a. Piston moves up in cylinder drawing fuel-air mixture into crankcase.

b. Piston moves down cylinder, pressurizing mixture in crankcase.

c. Piston moves past transfer port allowing pressurized mixture to move into combustion chamber.

d. Piston moves up in cylinder again.

  - It compresses fuel-air mixture.
  - It draws more fuel-air mixture into crankcase.

e. Spark plug fires compressed mixture.

f. Combustion moves piston back down cylinder.

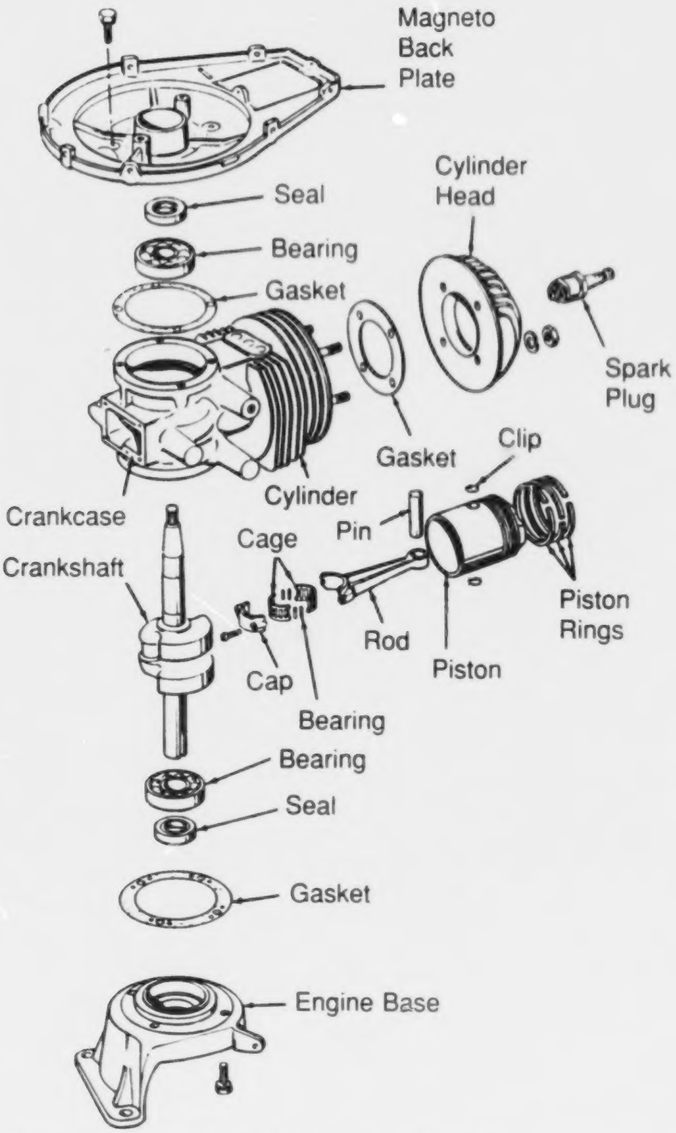
  - Piston uncovers exhaust port as it nears bottom of stroke allowing exhaust to escape.
  - Piston uncovers transfer port as it moves nearer bottom of stroke allowing fresh charge of fuel-air to enter combustion chamber.

g. Piston starts back up cylinder closing both transfer exhaust ports.

Information Sheet

5. Parts of a typical two-stroke cycle engine

Note: For simplicity, fuel and ignition systems have not been included in the diagram below.


Magneto Back Plate
Seal
Bearing
Gasket
Cylinder Head
Spark Plug
Gasket
Clip
Crankcase
Cylinder
Pin
Cage
Crankshaft
Piston Rings
Rod
Piston
Cap
Bearing
Bearing
Seal
Gasket
Engine Base

Courtesy of Jacobsen Division of Textron Inc.

Information Sheet

6. Types of fuel systems found on small engines

a. Gravity feed — Fuel flows from fuel tank through a fuel line and filter into the carburetor.

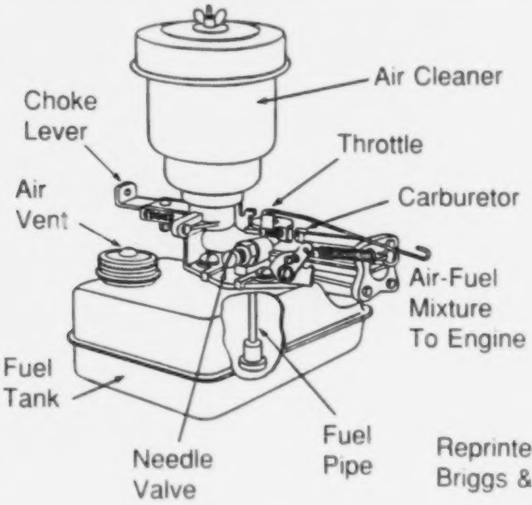
b. Suction feed — Fuel is drawn from the fuel tank by intake manifold vacuum to the carburetor.

Note: On small engines (3 hp. or less) this system can operate directly from fuel tank. On larger engines the fuel is first pumped (usually by a vacuum diaphragm pump) into a secondary reservoir located beneath the carburetor where fuel is supplied from a constant depth.

c. Pressure feed — Fuel is pumped from a remote fuel tank and supplied under pressure to the carburetor.

Note: Pressure feed systems are used where fuel tank is located a considerable distance from engine, or where engine is designed to be used in a variety of positions.

7. Basic components of a typical small engine fuel system



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a. Fuel tank and cap — Hold fuel supply without spilling or leaking fumes

b. Fuel delivery line — Delivers fuel to carburetor during engine operation

c. Fuel filter — Filters rust, dirt and other impurities from gasoline before it reaches carburetor (optional but highly recommended)

Information Sheet

d. Fuel pump (if required) — Forces up the fuel from the fuel tank to the carburetor during engine operation

e. Carburetor with choke assembly — Mixes intake air and raw fuel in proportions suitable for proper combustion (roughly 17:1 under normal conditions)

f. Choke device — Limits the amount of intake air allowed into the carburetor, thus enriching the fuel mixture for easier cold starting

g. Air cleaner — Traps dirt, dust, and other debris from intake air stream before it enters and clogs the carburetor

8. Maintenance requirements for fuel systems

a. Maintain system to prevent leaks and fuel contamination.

- Keep fuel lines and fittings tight and in good repair to prevent leakage and potential fires.
- Maintain full fuel supply, particularly in cold weather, to prevent water condensation contamination in fuel and rust in tank.

b. Keep fuel supply fresh or treated with anti-oxidants to prevent the formation of gums and varnishes which clog carburetors and cause difficult starting (particularly true on small two-stroke engines with fuel/oil mixtures).

c. Maintain fuel and air filters to prevent contamination of carburetor from rust, dirt, and other debris which could come from fuel tank or intake air.

9. Types of cooling systems found on small engines

a. Open draft — A system in which cooling fins provide a large surface area from which to dissipate waste engine heat in the air stream flowing past the engine

Note: Open draft cooling systems are generally used on vehicles such as motorcycles, go-karts, or model airplanes which develop relatively high speeds and a fairly constant stream of cooling air.

b. Forced draft — A system in which cooling air is forced by fan (usually the engine's flywheel equipped with blades) through a series of shrouds and baffles around the cooling fins of an engine regardless of air movement around the engine itself

Note: Forced draft cooling systems are especially needed on small engines powering stationary or slow moving machines such as pumps, generators, lawn mowers, tillers, etc.

Information Sheet

10. Maintenance requirements for cooling systems

a. Keep engine in clean condition. Dirt, oil, grass clippings, and other debris caught in the cooling fins retard the flow of cooling air, and insulate the engine's surfaces to prevent heat dissipation.

b. Maintain baffles and shrouds in good working condition. This will ensure proper cooling air flow on forced draft system engines.

11. Types of ignition systems found on small engines

a. Flywheel magneto (internal magneto) — Built into a small engine using magnets mounted on the engine's flywheel to induce small primary ignition circuit current

Note: Flywheel magnetos generally are used on the smaller engines (1.5 to 5 hp.) rated for homeowner and general consumer use.

b. External magneto — Mounted to the outside of a small engine, driven by the crankshaft or camshaft, which uses rotating permanent magnets to induce small primary ignition circuit current

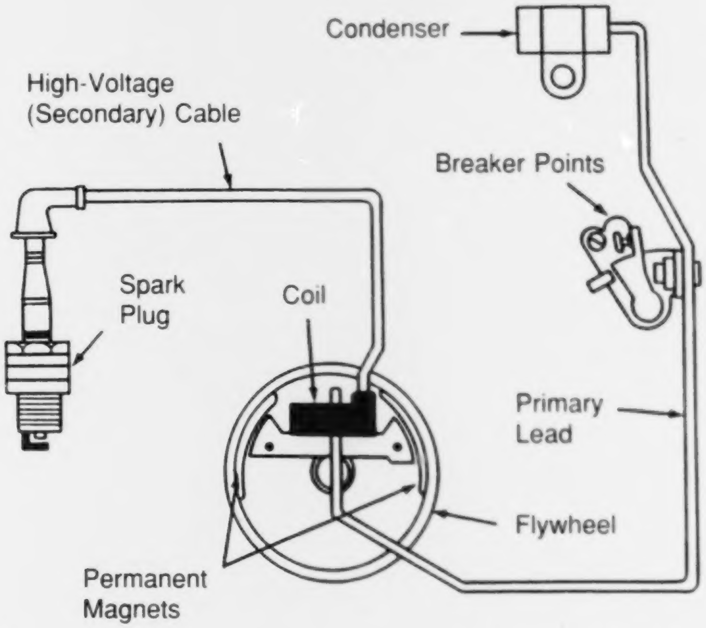
Note: External magnetos generally are found on industrial-use small engines rated from 5 hp. to 20 hp.

c. Battery ignition system — Uses a lead-acid storage battery for the primary ignition circuit current.

Note: Battery ignition system use on small engine applications is usually found on garden tractors, golf carts, and other equipment using automotive type storage batteries. Some lawn mowers, garden tillers, and other small lawn and garden equipment, however, are equipped with battery start magneto-fired engines.

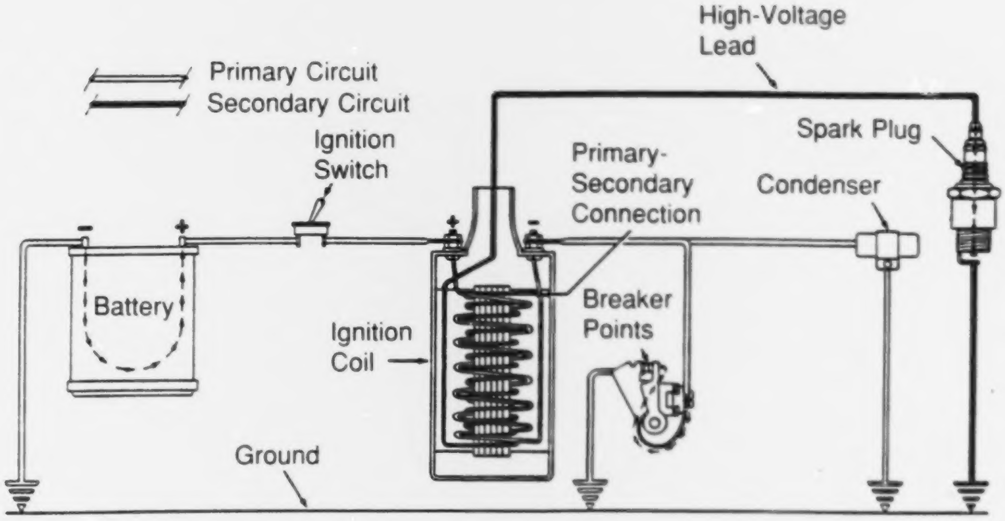
Information Sheet

12. **Components of a typical magneto ignition system**


Condenser
High-Voltage (Secondary) Cable
Breaker Points
Spark Plug
Coil
Primary Lead
Flywheel
Permanent Magnets

Courtesy of Kohler Co.

13. **Components of a typical battery ignition system**


High-Voltage Lead
Primary Circuit
Secondary Circuit
Ignition Switch
Spark Plug
Primary-Secondary Connection
Condenser
−
+
Battery
+
−
Breaker Points
Ignition Coil
Ground

Courtesy of Kohler Co.

Information Sheet

14. Maintenance requirements for ignition systems

a. Maintain proper electrode gap on spark plugs.

b. Select spark plug for proper heat range according to manufacturer's specifications.

Note: Many spark plug manufacturers make plugs to fit small engines of all designs and make. For instance, a Champion CJ-8 spark plug can be replaced in most applications with an Autolite 255. The choices are almost endless, and, to serve customers efficiently, knowledge of these choices is necessary for a parts specialist.

c. Breaker points must be gapped at the manufacturer's specified distance (usually around .020 inch), and must not be burned or melted.

d. To ensure satisfactory service life, lubricate breaker points where points ride on cam or plunger.

e. High voltage spark plug leads must be in good condition with no cracks or petroleum-soaked insulation.

Small Engine Parts and Systems
Unit 7

Student Supplement 1—Small Engine Types and Operation

The most popular type of small engine in use today is the "reciprocating" design which employs a piston moving up and down in a cylinder. The piston is connected to a crankshaft by a swiveling connecting rod, enabling the engine to develop turning motion from the reciprocating (up and down) action of the sliding piston.

Another type of engine using the Wankel, or rotary cycle, is quite different in design. Although the Wankel is used in some applications such as chain saws and snow mobiles, its use is very limited given the overall number of reciprocating engines being built. In this unit, our study will concentrate on the two basic designs of reciprocating engines—two-stroke cycle and four-stroke cycle.

The operation of both two and four stroke engines is very similar in that both use a moving piston attached to a crankshaft by a connecting rod. When ignition of a compressed fuel-air mixture takes place in the cylinder above the piston, the high pressure gases generated drive the piston down. This push, carried through the connecting rod, causes the crankshaft to rotate.

To this point, the actions are similar in both designs.

Two-Stroke Cycle Engine

In the two-stroke engine, however, the air-fuel mixture is admitted to the cylinder, and burned gases exit the cylinder, through openings or ports in the cylinder wall.

The fuel-air mixture is compressed in the cylinder every time the piston moves upward. Each time the piston nears top dead center (TDC), the mixture is ignited by a spark plug, resulting in high pressure gases formed during combustion pushing the piston downward to start the cycle again. So, two strokes (up and down) of the piston and connecting rod are required to complete a complete power cycle in a two-stroke engine.

Because they develop power on every stroke with a simple, relatively light weight design, two-stroke engines possess an extremely efficient power-to-weight ratio. This makes them particularly useful for handheld applications such as chainsaws, weed and hedge trimmers, etc., where high turning speeds are required. Also, because a two-stroke engine inherently develops its most useful power at higher speeds, it is extremely useful for rotary or "whirlwind" lawn mower applications as a direct-drive engine. In motorcycle and snowmobile use, however, a two-stroke engine must be geared through some sort of transmission to use its power efficiently.

Student Supplement 1

Four-Stroke Cycle Engine

A four-stroke engine does not have ports in the cylinder wall, but "breathes" through two spring-loaded poppet valves located in the cylinder block along side the cylinder bore, (L-head or Flathead engines) or through valves located in the cylinder head above the reciprocating piston (OHV or overhead valve.) These valves are operated by an eccentric known as a cam or camshaft operated by gears or a chain and sprocket assembly in many engines. The valves move up and down in valve guides cast into the cylinder block (L-head) or the cylinder head (OHV) and open at the proper time according to the design and timing of the camshaft on which they ride.

The intake valve allows a fresh charge of fuel-air mixture to be drawn into the cylinder as the piston retreats down the cylinder bore. At this time the exhaust valve is closed. As the piston reaches bottom dead center (BDC) the intake valve begins to close, allowing the fuel-air mixture to be compressed as the piston rises in the cylinder against two closed valves. Once the piston is near TDC, a spark plug ignites the mixture causing high pressure gases (up to 2,000 pounds per square inch) to drive the piston downward again. As the piston nears BDC again, the exhaust valve begins to open, allowing spent gases to rush out of the cylinder. This exhausting or "scavenging" continues as the piston again rises in the cylinder while the intake valve is closed and the exhaust valve is open. Shortly before the piston reaches TDC again, the exhaust valve closes and the intake valve begins to open for another cycle. In this case, the piston and connecting rod have traveled down and up the cylinder twice, or four strokes, to complete a cycle.

Although more complicated than the two-stroke design, four-stroke engines develop more turning force (torque) at slower speeds, therefore are more useful for high-load uses such as running rotary tillers and heavy garden tractors or other applications where lower speeds and high loads are encountered. With the exception of rotary or "whirlwind" mower applications small four-stroke engines also require some sort of gearing or transmission to efficiently use their output.

Student Supplement 1

Lubrication

The other major difference in two-stroke engines and their four-stroke counterparts is in the way they are lubricated. In both cases, lubrication is critical because of high temperatures encountered, and high performance expected from these small engines.

Two-Stroke—Because the crankcase is being used in the two-stroke engine as the path for the incoming fuel-air mixture (see Figure 1), it is impossible to run the rotating crankshaft and connecting rod in a bath of oil as is done in a four-stroke cycle engine. The lubrication must come from oil mixed directly with the fuel, or injected into the fuel-air stream as it enters the crankcase. Without this oil, friction would cause tremendous heat buildup between the moving surfaces of the crankshaft, connecting rod, piston wrist pin and between the cylinder walls and the piston itself. This eventually (usually in very little time) causes the engine to seize—requiring major machine work to repair the damage.

In most two-stroke applications, manufacturers require a gasoline/oil mixture to meet the lubrication needs of the two-stroke engine. Special oils have been formulated to mix thoroughly and stay in suspension in gasoline so that as the fuel/oil-air mixture is drawn through the crankcase of the two-stroke engine it provides a thin film of lubricating oil to all moving parts. Also, these special two-stroke oils are designed to burn cleanly, leaving little deposit in the combustion chamber and cylinder of the engine. Still, in many cases a tell-tale blue smoke trail will accompany the use of a two-stroke engine—especially if the operator has carelessly added too much oil to the fuel. Continued operation in this condition can cause oil-fouling of the spark plug and contributes somewhat to air pollution.

Ratios of fuel to oil range from 16:1 in many older and some modern engines, to as high as 100:1 in some more efficient boat motors, lawn mowers and snowmobile applications. (Always check with manufacturer's recommendations for the two-stroke-cycle oil required and the proper ratio.)

Caution: Never, under any circumstances use motor oil intended for use as crankcase oil in four-stroke engines as a fuel/oil mixture for a two-stroke engine. Regular motor oils will not always remain in suspension within the gasoline and they lack the additives necessary for trouble-free operation in a two-stroke engine. Lubricants approved for two-stroke operation will be labeled with a "TC" (two-cycle) designation and information on suitability for use in air-cooled and/or outboard marine use.

Student Supplement 1

Four-stroke—In the four-stroke engine, where fuel-air mixtures and exhaust gases are passed through the engine's cylinder head via a set of valves, the lubrication system consists of filling the crankcase with a prescribed amount of motor oil.

In many small engines the rotating action of the crankshaft and connecting rod (sometimes equipped with a "dipper") are designed to "splash" the oil to the proper places to keep cylinder walls, rod bearings, main bearings, wrist pin bearings, and cam and lifter surfaces lubricated. In newer, OHV design engines, and some L-head engines a plunger pump is driven by the camshaft to pump oil to critical areas of the engine such as main bearings and, in the case of OHV designs, the rocker arms and valve lifters. In addition to providing a lubricating surface to minimize wear and cut friction, the crankcase oil also serves to dissipate heat in the four-stroke engine.

Most small four-stroke engines are designed to use common automotive motor oils, as long as they are of the proper viscosity. Again, engine manufacturers are quite specific in the weight and grade of oil used in their engines. Always consult with their recommendations before installing or adding oil to a small air-cooled engine.

Crankshaft Orientation

In both two-stroke and four-stroke designs, engineers have developed engines for specific uses depending upon the direction from which the engine's turning power is needed. For instance, in a rotary lawn mower application, a rotating blade cuts grass as it is pushed along over the lawn. In this case a direct-drive engine must have a vertical crankshaft.

A generator with a horizontal armature, however, must have an engine that supplies power through a horizontal crankshaft.

Both vertical and horizontal crankshaft models are available in two-stroke and four-stroke engines to provide efficient power to these applicances without having to design elaborate "twisted drive belt" or power robbing differential gear design transmissions. Because of these differences, a parts specialist must be aware of the type of engine in use, its application and its individual model and serial number to be certain replacement parts will fit and function properly.

Student Supplement 1

Cylinder Orientation

In most cases, small engines consist of a single cylinder oriented in a horizontal manner in the case of a vertical crankshaft, or the cylinder will be vertically oriented in the case of a horizontal crankshaft.

For larger power requirements, however, additional cylinders may be used. An increasing number of garden tractors are using two-cylinder engines with the cylinders arranged in a "V" for horizontal crankshaft designs, or laterally opposed for the vertical crankshaft design.

In snowmobiles and motorcycles, in-line, and "V" type two, four, and six cylinder horizontal crankshaft engines are popular, while outboard boat motors use single cylinder designs, in-line two, four, and six-cylinder designs, and "V" four, six, and eight cylinder designs with vertical crankshafts.

Small Engine Parts and Systems
Unit 7

Student Supplement 2—Small Engine Fuel Systems

To burn properly in an internal combustion engine, gasoline must be mixed with air in a ratio of about 17:1 (air:fuel). Too much air will cause the engine to run "lean," overheat, and develop less than normal power. Too much fuel will cause the engine to run "rich," waste fuel and develop less than normal power and speed. In addition, a cold engine must have some method of enriching the mixture (a higher proportion of fuel to air) to start when vapor pressures of gasoline are low.

To accomplish this, various designs of fuel systems have been used on small engines—depending upon their intended use.

Basically, there are three types of fuel systems in use on these engines: gravity feed, suction feed, and pressure feed.

Gravity feed—Fuel flows from a fuel tank through a fuel line and filter to the carburetor.

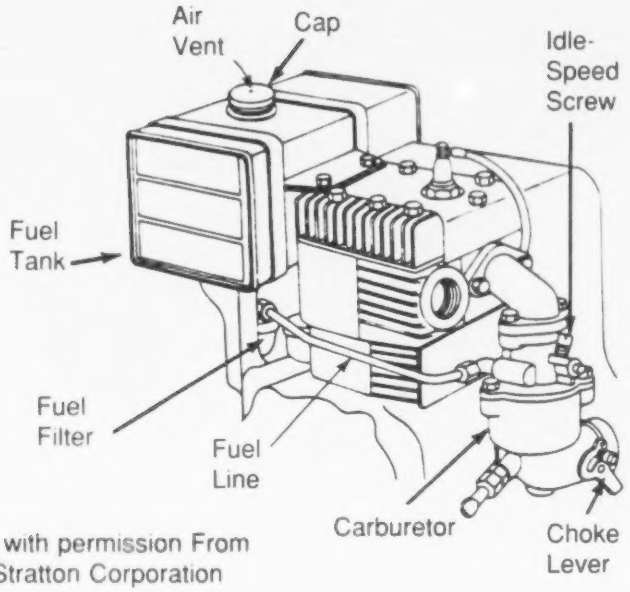
Suction feed—Fuel is drawn from the fuel tank by intake manifold vacuum to the carburetor. In the case of small engines (3 hp or less) this can occur directly from the fuel tank through a fuel pickup line extending downward from the carburetor. In many engines this size and larger, however, the intake manifold vacuum is used to operate a diaphragm pump which lifts fuel from the tank to a secondary reservoir from which the carburetor draws its supply.

Pressure feed—Fuel is pumped from a remote fuel tank and supplied under pressure to the carburetor.

The carburetor itself is an adjustable device designed to mix raw, liquid gasoline and incoming filtered air into an atomized mixture suitable for combustion in the engine. To provide for an enriched mixture for cold starts, the carburetor is equipped with a device (a choke) to limit the incoming air flow being drawn into the engine by the downward motion of the piston on the intake stroke. As air flow is restricted, increased amounts of fuel are drawn into the carburetor, enriching the fuel/air mixture and allowing for easier ignition in cold conditions.

A typical fuel system on a small engine will include the following parts: a fuel tank and cap, a fuel line, a fuel filter (optional), a fuel pump if required, a carburetor with choke assembly, and an air filter to catch dust and grit before it enters the carburetor in the intake air.

Student Supplement 2



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Fuel System Maintenance

Because small engines are used in all kinds of weather in outdoor applications, using top quality, fresh gasoline of the proper octane level is very important to long engine life and ease of operation.

Small engines should be maintained with full fuel tanks in cool weather to prevent water condensation inside the tank from polluting the gasoline. Also, if the engine will not be used for several weeks during cold weather, the tank should be drained and the carburetor run "dry" to prevent oxidation of the fuel.

Oxidation and condensation pollution can cause gasoline to be difficult to ignite in the engine and usually cause it to take on a "varnish" like odor. Although not quite so important in four-stroke engines, where gasoline is not mixed with oil, in two-stroke applications this is very important. The oil/fuel mixture tends to deteriorate quite rapidly in storage—many times causing the need for a complete fuel system disassembly and cleaning. Several manufacturers are now making fuel additives to prevent this oxidation and resulting "stale" gasoline, but their use has to be consistent to prevent fuel deterioration.

Also, given the tremendous work a small engine accomplishes, and the dusty, dirty conditions in which many are used, the condition of fuel filters and air cleaners are of top priority.

Student Supplement 2

In many cases, manufacturers will tell you a dirty air cleaner can result in rapid engine wear and the need for a mechanical overhaul in only a few hours of operation. In addition to quality air cleaner elements, many engine builders are now recommending an additional oil-soaked plastic foam pre-filter be used on the outside of air cleaner elements to further purify the intake air. Proper maintenance of filters is of prime importance to long small engine life, and is a major concern of the parts specialist in his or her work with customers.

Small Engine Parts and Systems
Unit 7

Student Supplement 3—Small Engine Cooling Systems

As gasoline is burned to convert chemical energy into mechanical energy much of that chemical energy is wasted in excess heat from combustion and friction. This heat, if not drained away in a timely manner can cause moving parts of an engine to "seize" together and other parts to warp or melt.

For ease of use and manufacture, small engines are designed to be cooled by the air surrounding them during their use. In this way, they avoid having to be equipped with radiators, water jackets, power-robbing water pumps, and other plumbing related to liquid cooled engines such as those found in cars and trucks.

Large fins, (heat sinks) are cast around the cylinders and cylinder heads to drastically increase the surface area of the engine exposed to the air. Through a process called conduction, heat from inside the engine is transferred through the metal of the cylinder and cylinder head to the surrounding air. As that air moves by the engine it carries heat away in a process called convection.

Types of Cooling Systems

Two types of cooling systems exist on small air-cooled engines: open draft and forced draft.

On open draft cooling systems natural air movement around the engine is relied upon to carry away excess heat. Such applications might include motorcycle or go-kart engines, where the movement of the vehicle causes a sufficient air stream to carry away damaging engine heat.

Forced draft cooling systems, however, rely upon a fan or blower (usually the engine's flywheel which is equipped with blades) to move air through a series of shrouds or baffles around the engine in a way to dissipate its heat. This type of engine is used in stationary applications or on equipment which does not move fast enough to provide a sufficient air stream for engine cooling. (Examples might include: pumps, lawn mowers, tillers, generators, etc.)

Student Supplement 3

Cooling System Maintenance

Small engines, because of their rugged dependability and simple designs, many times do not receive the maintenance they require for long lives. One of the chief problems is lack of cooling system maintenance on engines that must operate in dusty, trash-filled environments such as lawn and garden applications etc.

One of the most important services is to keep the engine free of dirt and debris. Dirt, grass clippings, oil, and dust act as a blanket on cooling fins and allow the engine to overheat—even though its forced draft system is operating.

Also, small engines should be inspected frequently for loose bolts and misalignment of cooling shrouds and baffles. (In some cases the same cooling shroud that surrounds the flywheel is designed to provide airflow to the engine's air-vane governor. So, proper alignment and tight bolts are essential to proper engine operation.)

Small Engine Parts and Systems
Unit 7

Student Supplement 4—Small Engine Ignition Systems

The purpose of the ignition system is to supply a high voltage surge to a spark plug at the proper time to ignite the compressed fuel-air mixture in the engine's cylinder. This surge must be available every time the engine is oriented for a power stroke which occurs thousands of times every minute.

Two basic types of ignition systems are used on today's small engines: the self-contained magneto and the battery ignition system.

Magneto Ignition

A magneto is an engine-driven device that generates its own small pulse of electrical current, transforms that current into a high-voltage surge, and delivers that surge to the spark plug. Some magnetos are built into the engine with permanent magnets mounted in the flywheel which induce current into a nearby transformer (coil) with each revolution of the engine. These are usually referred to as a "flywheel magneto." Others are mounted on the outside of the engine and are driven by the crankshaft or camshaft. In either case, however, moving magnets pass by a stationary conductor (coil windings) to induce a small electrical current that is transformed into ignition sparks. No ignition switch is needed on such engines. As long as the engine turns, current is supplied by the magneto and the spark plug will spark.

Most small engines use the "flywheel magneto" system because of its simplicity and low cost manufacturing requirements. Because of advanced electronics, in many cases the only moving parts found in these systems today are the magnets which rotate with the flywheel. All switching and circuit breaking activities, once handled by mechanical breaker points, are now routed through diodes and transistors to achieve the same result with no maintenance. Such "breakerless" systems are known as "solid state" ignition systems. Still, many engines remain in service which use the traditional "points and condenser" system which requires periodic maintenance and replacement of parts.

Battery Ignition Systems

The battery ignition system differs from magneto systems in two ways. First, in the battery system the electrical current for ignition is supplied by a battery or an alternator (or motor-generator in some cases) as in an automobile. Second, an ignition switch must be closed for the system to operate.

The battery ignition system uses a separate ignition coil or transformer, similar to that of a magneto system, but the initial source of electricity comes from the battery.

Student Supplement 4

In a battery ignition system, breaker points operated by a cam, or solid state circuitry timed to the crankshaft position, turn this primary electricity on and off at the proper time. As the points close, or the ignition module turns on the current, electricity flows from the battery to the primary winding of the ignition coil. This current flow builds up a strong magnetic field. But, once the breaker points open, or the ignition module turns off the current, the magnetic field collapses around the primary winding and the nearby secondary winding—inducing a high voltage surge in the secondary winding of the coil. Since the secondary winding of the coil is connected to the spark plug, the high voltage impulse is felt at the plug's electrodes, the current jumps across the spark plug's air gap and in doing so ignites the waiting compressed fuel-air mixture in the engine.

To aid in the quick collapse of the primary winding magnetic field on a "points and condenser" system, the condenser allows a place for current to flow as the breaker points begin to open, otherwise harmful arcing would take place at the breaker points and intense heat would ruin them in a short time. The condenser's "absorption" of a primary current flow also helps stop it abruptly—further intensifying the collapse of the primary magnetic field.

Ignition System Service

Periodic maintenance of small engine ignition systems is necessary for long, efficient engine life.

The ignition component that causes most problems to small engine owners is the spark plug, which is exposed to the heat, combustion, and varying fuel-air mixtures of the engine. Spark plugs must be properly gapped, that is their electrodes must be within a specific distance of one another based on manufacturer's designs. Also, they must be of the proper "heat range." This refers to the internal design of the spark plug and how fast it dissipates heat from the combustion chamber. A plug that is "too hot" for a given engine will overheat and fail much faster than a "cooler" plug which was designed for the engine. Likewise, a plug that is too "cool" for a given engine might collect oil, fuel, and carbon deposits during the combustion process and short or "foul out."

Breaker points, too, (on magneto and battery-ignition systems) must be set to open a given distance. (Usually .020 to .035 inches.) If this point "gap" is set too close the points will overheat, melt, and fail. If the gap is too wide engine timing is delayed causing the engine to lose power or fail to start.

On flywheel magneto engines, the air gap between the flywheel magnets and the magneto coil must be set according to manufacturer's design specifications. If this air gap is too wide, insufficient current will flow to operate the ignition system. If the air gap is too close mechanical damage can occur as the flywheel contacts the coil.

Small Engine Parts and Systems
Unit 7

Student Supplement 5—Troubleshooting Small Engine Ignition Systems

A parts specialist working in a store that handles small engine parts will inevitably be asked to help troubleshoot a small engine for a customer. Although a basic knowledge of how these engines work is a key to solving problems, a systematic checklist can provide a good way to pinpoint malfunctions. The following is a guide to determining where problems lie in small engine ignition systems.

The first check to be made is the "spark test." Is there high voltage traveling to the spark plug?

To make this test, disconnect the spark plug lead from the spark plug, pull back the rubber boot on the end of the lead to expose the metal clip. Hold that clip about 3/16 inch from the engine's cylinder head and crank the engine. If a strong blue-white spark jumps the air gap to the cylinder head there's probably nothing wrong with the ignition system. If the spark is very weak or non-existent, the ignition system is at fault.

If there is no spark or a very weak spark, the contact (breaker) points may be worn, dirty, or out of specification for proper gap. Or, the condenser may have failed or be failing. Other things to check would be possible breaks in the spark plug lead, a defective ON-OFF switch, or a defective magneto coil or discharged battery.

Note: If an engine has been exposed to rain or has been washed recently, the parts of a magneto or battery-ignition system can become wet, thus shorting out primary and secondary electrical currents. Many times a wet engine can be started by carefully drying spark plug leads, the plug itself, and the contact points. In other cases, the system must be allowed to air dry until current again flows according to its designed path.

If an engine backfires or kicks back when starting, the breaker point gap may be too great—causing ignition to occur too early and forcing the piston back down before it reaches the top of the cylinder. This can be caused by worn or improperly gapped breaker points, or, in the case of a magneto engine, serious wear in the parts which drive the magneto.

Small Engine Parts and Systems
Unit 7

Assignment Sheet 1—Solve Problems Related to the Operation and Maintenance of Small Engines

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions followed	______
Knowledge of small engine technology is evidenced by correct answers	______

Introduction: A parts specialist working in a store or shop servicing small engines will ultimately be called upon to make judgments concerning parts and services based upon a working knowledge of small air-cooled engines that power many tools and recreational machines. This assignment sheet contains several scenarios involving "real life" situations which might confront one working at the parts counter of a store catering to customers working on small engines.

Directions: Read the following scenarios, and based upon your knowledge of small engines and the information found in Student Supplements 1 through 5, answer the following questions on the blanks provided.

1. A homeowner comes to your store to purchase several "tune up" items for a used Toro power lawn mower he has just purchased at a garage sale. He has asked for a new air filter element, and a spark plug, and says he'd like to change the oil on the mower's engine but can't seem to find the drain plug. The customer has provided you with the mower's model number so you begin looking for the correct parts. In your search, you determine the mower is equipped with a single-cylinder two-stroke engine manufactured by Suzuki. You cross-reference the spark plug and air cleaner and determine you have them in stock. You also find an exploded view of the engine in your reference material to show the customer. What do you tell him?

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Assignment Sheet 1

2. In your opinion, why do manufacturers use two-stroke engines on chainsaws and weed trimmers?

3. It's autumn and a customer tells you she has read a lawn mower should be "winterized" before it is stored for cold weather. What should she do to her mower before putting it away for the winter?

4. You have a friend who says he gets lots of extra performance from his riding lawnmower by taking the air cleaner off and replacing the muffler with a six-inch piece of threaded straight water pipe. It's loud, he says, but it will really rev up and cut grass! What problems is this friend likely to encounter?

5. A customer brings a 3 hp. four-stroke Briggs & Stratton engine to your store for service. The engine, which powers a portable grain auger on a farm, has been consuming excessive amounts of oil and began knocking before it finally stopped abruptly. You look at the engine and see it is covered with grain dust and enough wheat straw sticks out of the fins around the cylinder head the engine looks as if it is a winter bouquet. After removing the spark plug you note the electrodes are nearly burned away and what material is left on the electrodes is pitted and melted. What is the apparent cause of the engine's problems?

Assignment Sheet 1

6. You receive a call from one of your neighbors who can't seem to start his Cub Cadet lawn tractor. It is powered with a 12 hp. Kohler engine equipped with an automotive battery-ignition system and starter-generator. He says he just replaced the engine's spark plug and installed a new set of breaker points. Still, the engine tries to start but "bucks" and backfires instead. He has nearly run the battery down trying to start the engine he attempted to tune up. What would be a likely trouble spot in this scenario?

7. A teenager who mows lawns for school money during the summer comes into your store in early July, the third time since school was out in late May, bringing with him a set of breaker points from his two-stroke Jacobsen mower. The contacts are melted and bridged across, just like the other two times he has bought replacements from you. What would you suggest the customer check, to prevent continued breaker point failure through the rest of the summer?

8. Your store has just taken a used garden tiller in as a trade-in. It looks relatively clean and well cared for, although you know it is a number of years old. It might be just the thing for your mother, who is an avid gardener if the price is right, but the customer who traded it told you it wouldn't start. "It was running pretty well two year's ago when we put it away," he said. "But, I tried to start it yesterday and it just wouldn't do anything!" Besides draining the fuel tank and replacing the old gasoline with fresh fuel, explain what you would do to determine where the problem might lie?

Assignment Sheet 1

9. Your cousin has just finished shredding leaves with a shredder-grinder powered with a horizontal shaft 4 hp. Briggs & Stratton four-stroke engine. Before putting the machine away for the winter, he washed it down with the garden hose to remove sawdust, wood chips, and other debris which had collected in the engine's cooling fins and around the flail blades of the grinder. After the machine was clean, your cousin tried to start it to "warm it up" and blow away the excess water . . . but it refused to start. It wouldn't even cough. What do you advise him to do?

Tools and Fasteners
Unit 8

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify various hand tools, service equipment, and fasteners sold in parts stores and measure bolts and threads. The student should demonstrate these competencies by completing the assignment sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to tools and fasteners with their correct definitions.
2. Identify basic tools that are commonly sold in parts stores.
3. Identify service tools that are commonly sold in parts stores.
4. Identify types of fasteners used in automotive and small engine repair.
5. Match bolt and thread dimensions with their measurement techniques.
6. Measure bolts and threads. (Assignment Sheet 1)

Tools and Fasteners
Unit 8

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Make transparency from the transparency master included in this unit.
- Obtain a number of examples of tools and service equipment covered in this unit to demonstrate to the class.
- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms related to tools and fasteners with their correct definitions.

- Read and discuss with the class the various terms and definitions. Try to give examples of each to enhance comprehension.

Objective 2 Identify basic tools that are commonly sold in parts stores.

- Show examples of basic tools that are sold in parts stores. Discuss their uses with class. **(Listening for content; orally communicating a thought or idea)**

- Organize class members into groups or teams to research and report orally to the class on the uses of various tools and on current prices of such tools at local parts stores. **(Listening for content; applying technical terms; orally communicating a thought or idea; teamwork)**

Objective 3 Identify service tools that are commonly sold in parts stores.

- Show examples of service tools that are sold in parts stores. Discuss their uses with class. **(Listening for content; orally communicating a thought or idea)**

- Let students review product catalogs to gather descriptions of various service tools sold in parts stores. Assign students to teams or groups and have them prepare a visual report that shows current prices and product warranties for tools. **(Reading/listening for content; orally communicating a thought or idea; applying technical terms; creative thinking; teamwork)**

Objective 4 Identify types of fasteners used in automotive and small engine repair. **Objective 5** Match bolt and thread dimensions with their measurement techniques.

- Show examples of each type of fastener covered in this objective and discuss the various applications for each. **(Listening for content; orally communicating a thought)**

Suggested Activities

- Discuss U.S. Standard (coarse threads) and SAE Standard (fine threads) and metric measured threads. Explain the importance of measuring bolt threads to determine proper fastener for a specific job. **(Listening for content; applying technical terms)**
- Discuss and demonstrate the use of a thread gauge when measuring threads per inch and the use of a steel rule when measuring bolts. Provide students with a thread gauge and steel rule, an assortment of bolts (designated A-H), and hand out Assignment Sheet 1 "Measure Bolts and Threads." **(Listening for content; applying technical terms)**

Evaluation

- Evaluate assignment sheet. See the evaluation criteria listed at the top of the assignment sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test and assignment-sheet scores on "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Automotive Wholesaler Counterman's Handbook*. Chicago, IL: Automotive Service Industry Association.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management*. Albany, NY: Delmar Publishers Inc., 1989.
- Notgrass, Troy. *Auto Parts Counter Worker*. Austin, TX: Instructional Materials Center, University of Texas at Austin.

Tools and Fasteners
Unit 8

Answers to Written Test

1. a. 5
   b. 3
   c. 4
   d. 1
   e. 2
   f. 6

2. a. Offset screwdriver
   b. Standard screwdriver
   c. Phillips screwdriver
   d. Vise grip or lock grip pliers
   e. Needle nose pliers
   f. Slip joint pliers
   g. Box end wrench
   h. Open end wrench
   i. Combination end wrench
   j. Pipe wrench
   k. Ratchet handle
   l. Extension
   m. Break over handle
   n. Universal socket
   o. Deep well (6 point) socket
   p. Standard (12 point) socket
   q. Phillips socket
   r. Clutch head socket
   s. Ball-peen hammer
   t. Rubber mallet
   u. Drift punch
   v. Center punch
   w. Cold chisel
   x. Flat file
   y. Round file
   z. Carbon scraper
   aa. Lug wrench
   bb. Allen wrench set

3. a. Battery hydrometer
   b. Growler
   c. Timing light
   d. Radiator pressure tester
   e. Straightening cone
   f. Power chisel
   g. Grease gun
   h. Brake spring pliers
   i. Brake adjusting tool
   j. Dust cover remover

Answers to Written Test

k. Ball joint removing tool
l. Valve spring compressor
m. Cylinder deglazing hone
n. Dial indicator
o. Flywheel turner

4. a. Hex head bolt
b. Cap screw
c. Castle nut
d. Wing nut
e. Flat washer
f. Lock washer
g. Internal prong snap ring
h. Cotter pin
i. Woodruff key
j. Stud
k. Rivet
l. Tapping screw

5. a. 2
b. 3
c. 1

Tools and Fasteners
Unit 8

Written Test

Name ______________________________ Score ________________

1. Match terms related to tools and fasteners with their correct definitions. Write the numbers on the blanks.

_____a. Steel rod with threads on both ends; is screwed permanently into a fixed part at one end and receives a nut on the exposed end

_____b. Device used to secure or hold together separate items

_____c. Pointed and headed cylindrical fastener that is threaded and designed for insertion into material by rotating

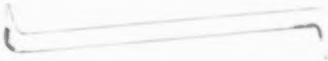
_____d. Metal rod or pin for fastening objects together; has a head at one end, a screw thread at the other end, and is secured by a nut

_____e. Internally threaded screw cutting tool used for forming external screw threads

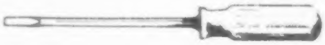
_____f. Tool for forming internal screw threads

1. Bolt
2. Die
3. Fastener
4. Screw
5. Stud
6. Tap

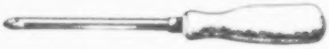
2. Identify basic tools that are commonly sold in parts stores.



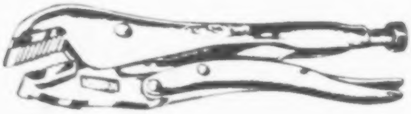
a. ____________________



b. ____________________

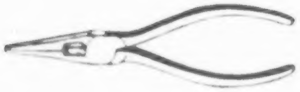


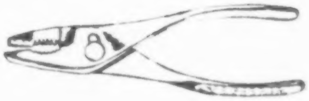
c. ____________________



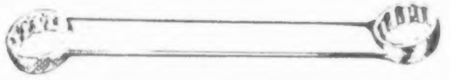
d. ____________________

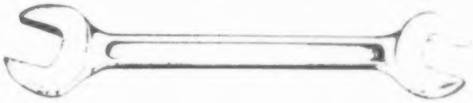
Written Test



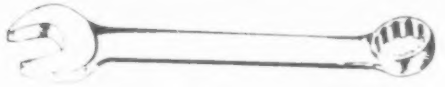


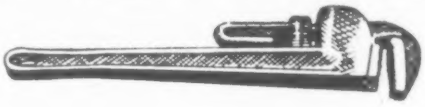
e. ____________________ f. ____________________



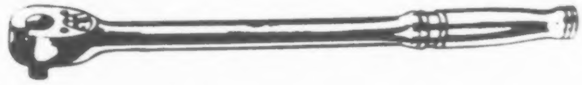


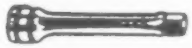
g. ____________________ h. ____________________



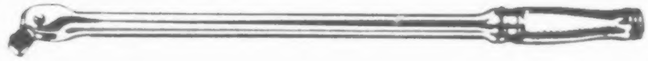


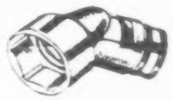
i. ____________________ j. ____________________



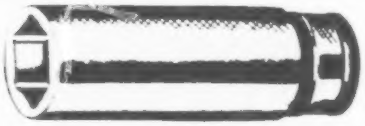


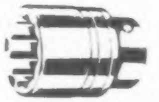
k. ____________________ l. ____________________



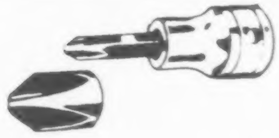


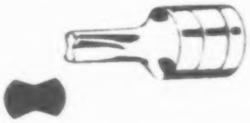
m. ____________________ n. ____________________





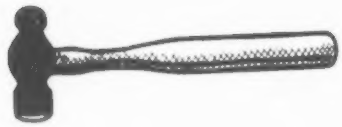
o. ____________________ p. ____________________



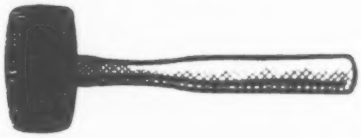


q. ____________________ r. ____________________

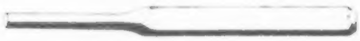
Written Test



s. ______________________

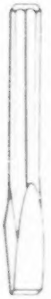


t. ______________________



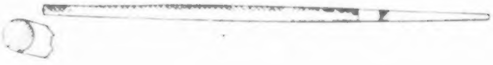
u. ______________________

v. ______________________

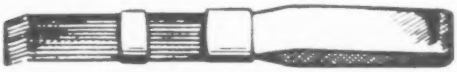


w. ______________________

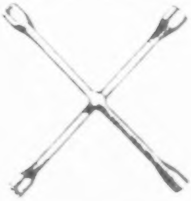
x. ______________________



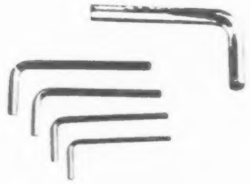
y. ______________________



z. ______________________



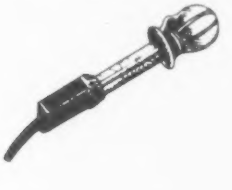
aa. ______________________



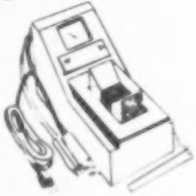
bb. ______________________

Written Test

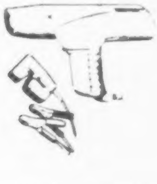
3. Identify service tools that are commonly sold in parts stores.



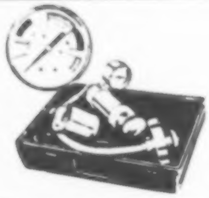
a. ____________________



b. ____________________



c. ____________________



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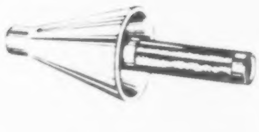

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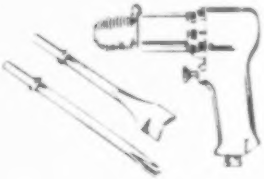

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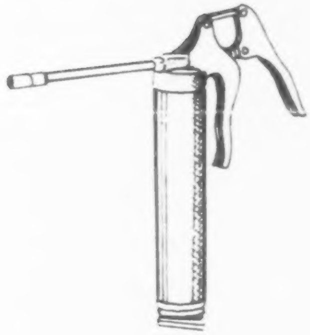

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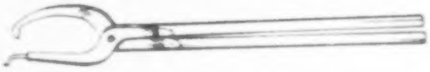

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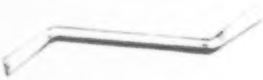

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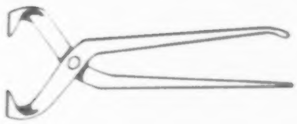

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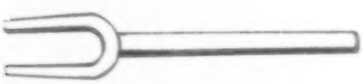
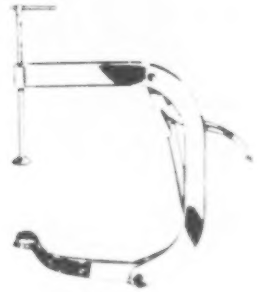


k. ____________________

Written Test



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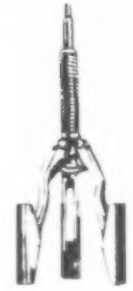

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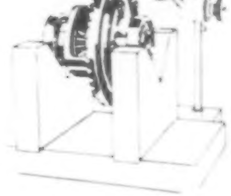

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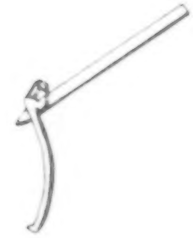
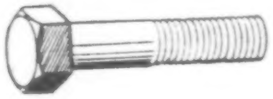


o. ____________________

4. Identify types of fasteners used in automotive and small engine repair.



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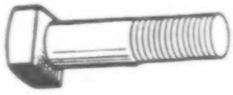
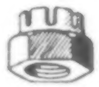


b. ______________



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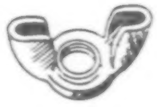

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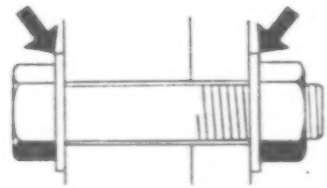

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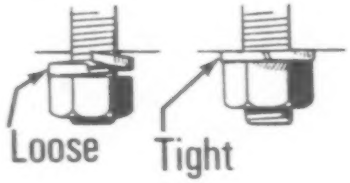

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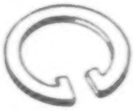

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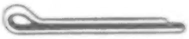
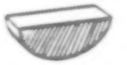
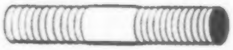


h. ______________

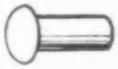


i. ______________

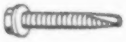
Written Test



j. ________________



k. ________________



l. ________________

5. Match bolt and thread dimensions with their measurement techniques. Write the numbers on the blanks.

______a. Determined by measuring the diameter of the thread end

______b. Determined by measuring the distance from bottom of the head to the end of the threads

______c. Determined by measuring with a ruler or thread gauge the number of threads per inch

1. Number of threads per inch
2. Size of bolt
3. Length of bolt

*Permission to duplicate this test is granted.

Tools and Fasteners
Unit 8

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Measure Bolts and Threads Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

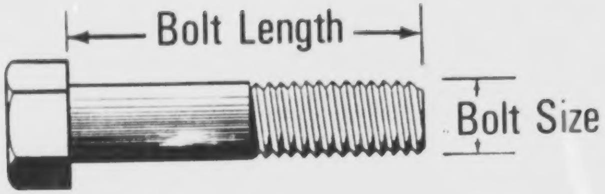
____

Teacher Signature ______________________________ Date __________

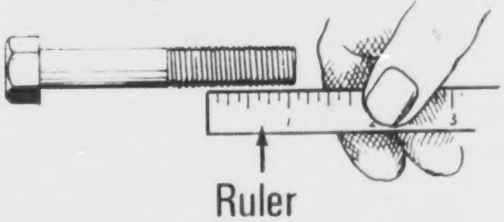
Student Signature ______________________________ Date __________

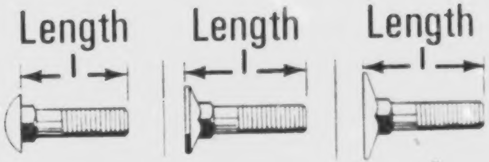
*Permission to duplicate this form is granted.

How to Measure Bolts and Threads


Bolt Length
Bolt Size

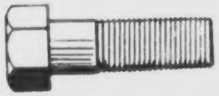
Measuring Threads Per Inch



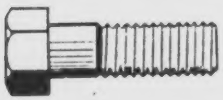

Length
Length
Length

Parts Specialist, Unit 8
Teacher Page 15

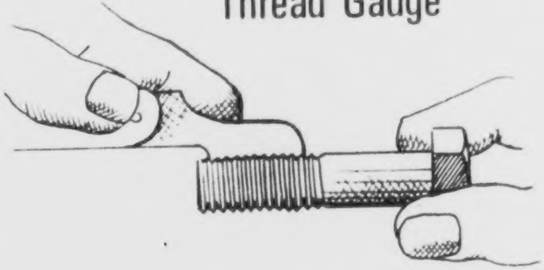
Fine Thread



Coarse Thread



Thread Gauge



Tools and Fasteners
Unit 8

Information Sheet

1. **Terms and definitions related to tools and fasteners**

   a. **Bolt** — Metal rod or pin for fastening objects together; has a head at one end, a screw thread at the other end, and is secured by a nut

   b. **Die** — Internally threaded screw cutting tool used for forming external screw threads

   c. **Fastener** — Device used to secure or hold together separate items

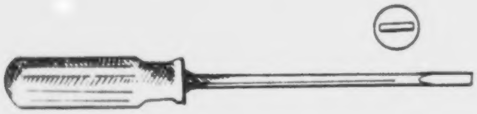
   d. **Screw** — Pointed and headed cylindrical fastener that is threaded and designed for insertion into material by rotating

   e. **Stud** — Steel rod with threads on both ends; is screwed permanently into a fixed part at one end and receives a nut on the exposed end

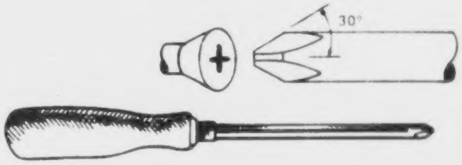
   f. **Tap** — Tool for forming internal screw threads

2. **Basic tools that are commonly sold in parts stores**

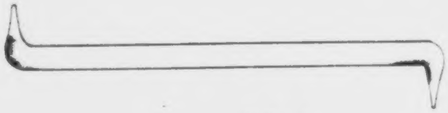
   a. **Screwdrivers**



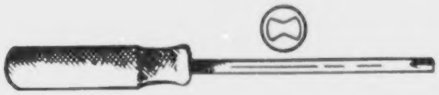
Standard or common



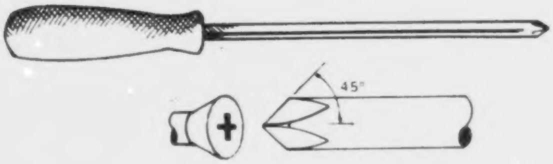
Phillips



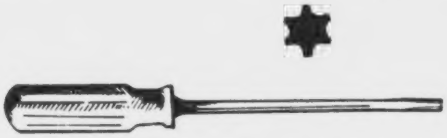
Offset



Clutch head



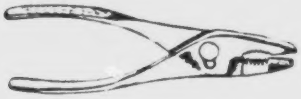
Reed and Prince



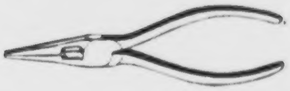
Torx head

Information Sheet

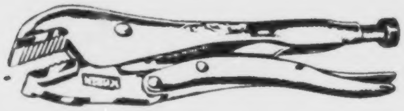
b. Pliers



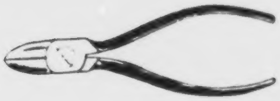
Slip joint



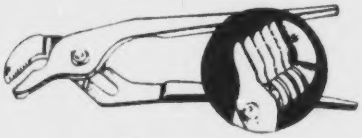
Needle nose



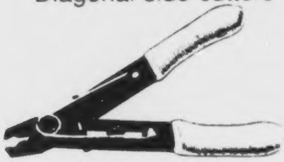
Vise (Lock) grip



Diagonal side cutters

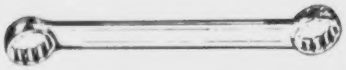


Channel lock

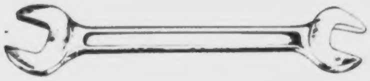


Wire strippers

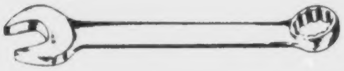
c. Wrenches



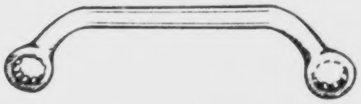
Box end



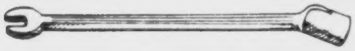
Open end



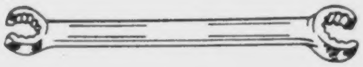
Combination end



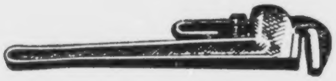
Obstruction box end



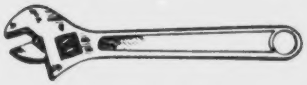
Flex head



Tubing



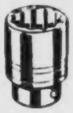
Pipe

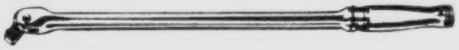


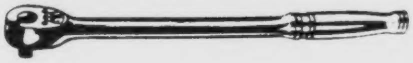
Adjustable end (Crescent)

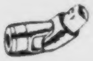
Information Sheet

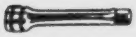
d. **Components of a socket set**

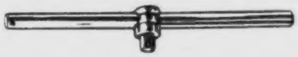

Socket

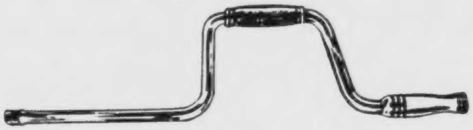

Break-over handle


Ratchet handle

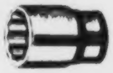

Universal joint


Extension

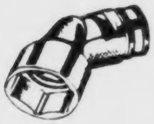

Sliding tee handle

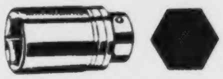

Speed handle

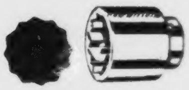
e. **Sockets**


Standard

Deep well

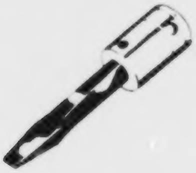

Universal


Six point

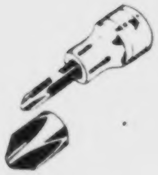

Twelve point

Information Sheet

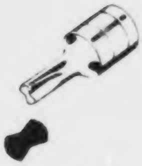
f. **Special purpose sockets**



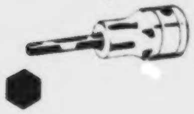
Standard



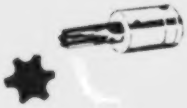
Phillips



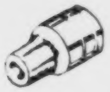
Clutch



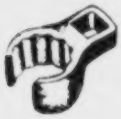
Allen or hex head



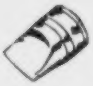
Torx



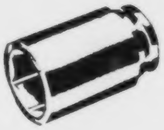
Shock absorber



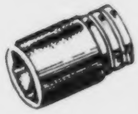
Crowfoot



Drag link

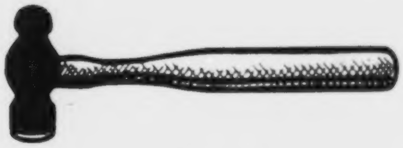


Impact

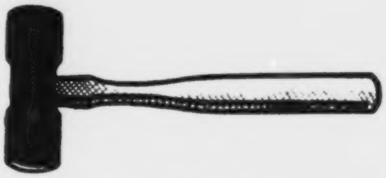


Oil sender

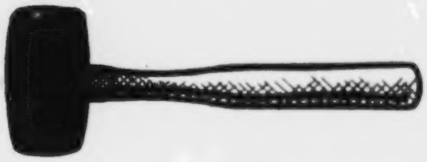
g. **Hammers**



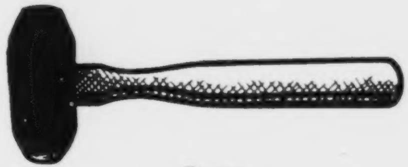
Ball peen



Plastic tip



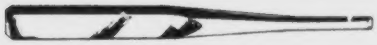
Rubber



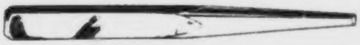
Brass

Information Sheet

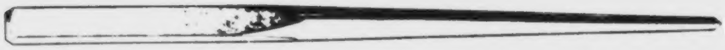
h. Punches



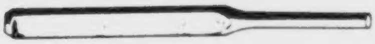
Pin



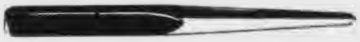
Starting



Lining-up (alignment)

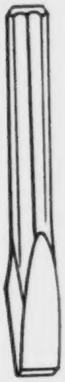


Drift

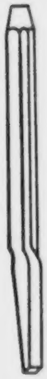


Center

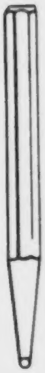
i. Chisels



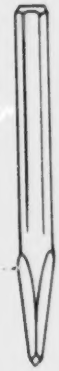
Cold



Cape



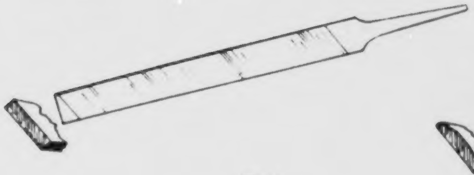
Round nose



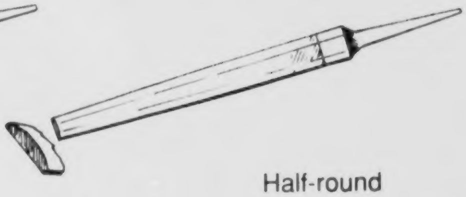
Diamond point

Information Sheet

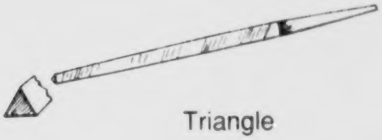
j. **Files**



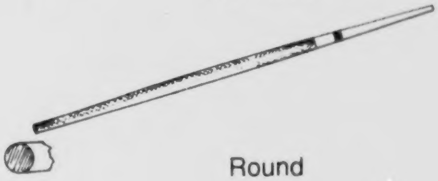
Flat



Half-round

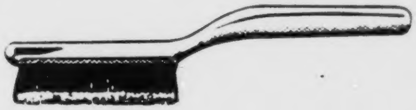


Triangle

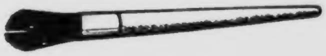


Round

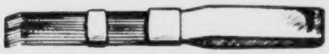
k. **Parts cleaning tools**



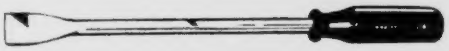
Wire brush



Parts cleaning brush

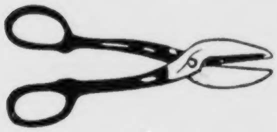


Carbon scraper



Gasket scraper

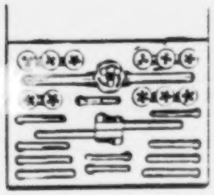
l. **General shop tools**



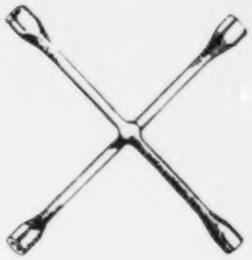
Metal cutting shears

Hacksaw

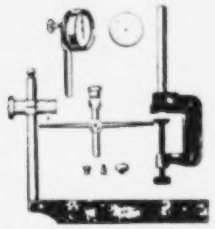
Information Sheet



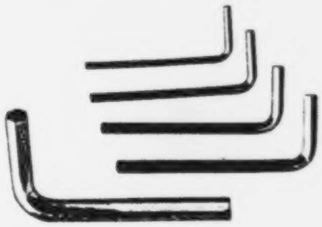
Tap and die set



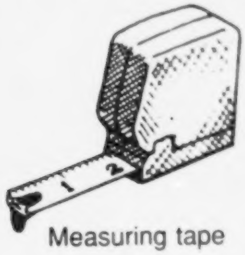
Lug wrench



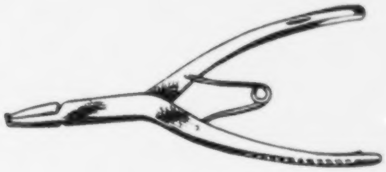
Dial indicator set



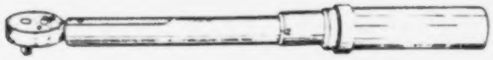
Allen wrench set



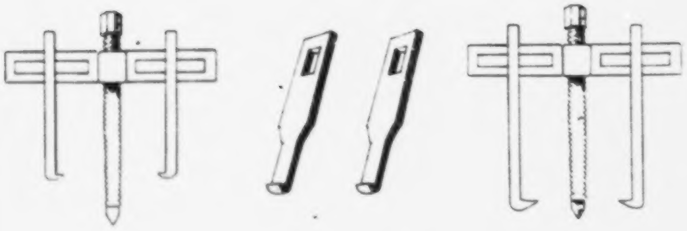
Measuring tape



Snap-ring pliers



Torque wrench

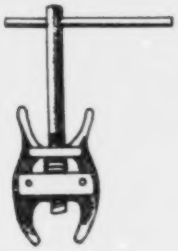


Puller set

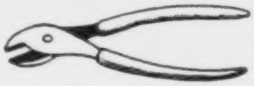
Information Sheet

3. **Service tools that are commonly sold in parts stores**

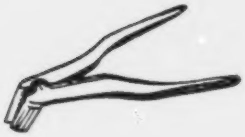
   a. **Battery service tools**



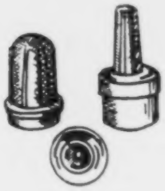
Cable puller



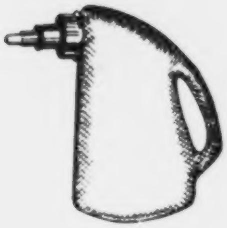
Terminal pliers



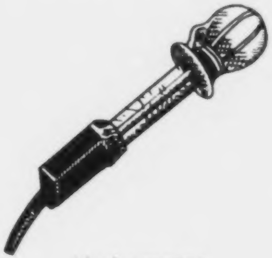
Cable spreader



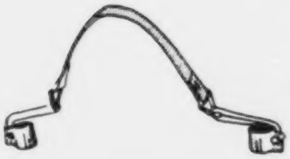
Post and cable cleaner



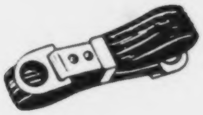
Battery filler



Hydrometer



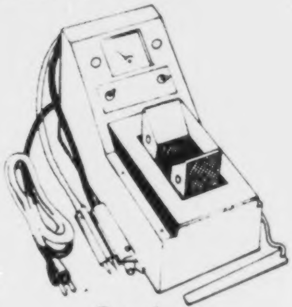
Lifting strap



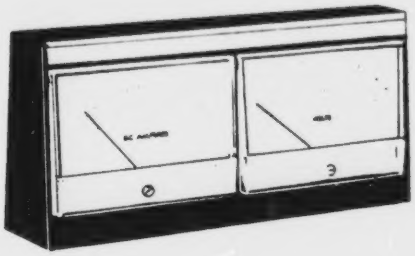
Battery carrying strap

Information Sheet

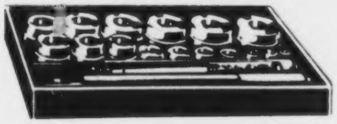
b. **Starter service tools**



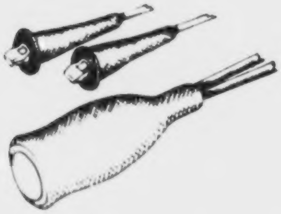
Growler



Amp-volt tester

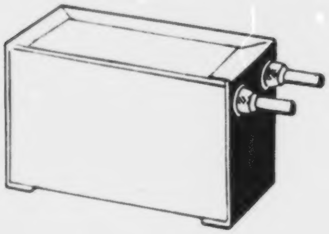


Bushing driver set

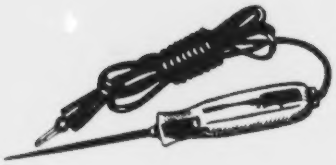


Remote control starter switch

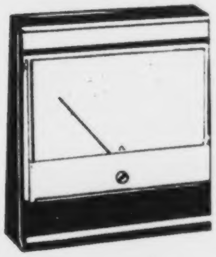
c. **Charging system service tools**



Diode tester



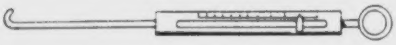
Continuity light



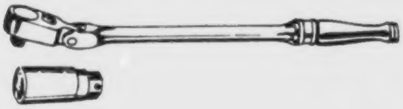
Ohmmeter

Information Sheet

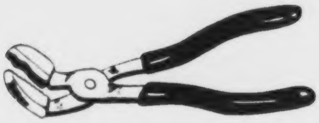
d. **Ignition system service tools**



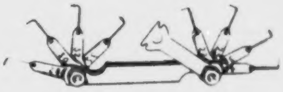
Spring gauge



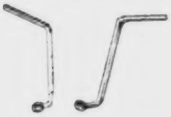
Spark plug ratchet and socket



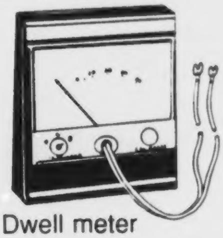
Insulated pliers



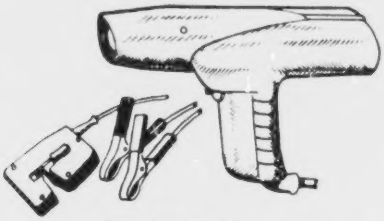
Spark plug gauge



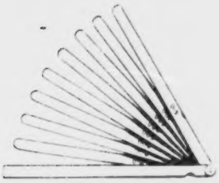
Distributor wrenches



Dwell meter

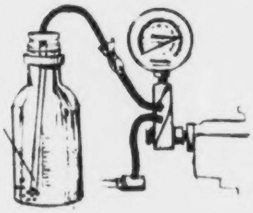


Timing light

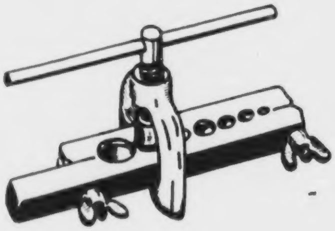


Feeler gauge

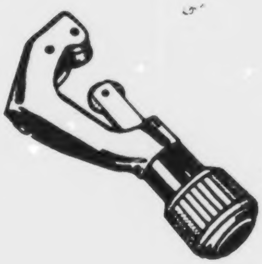
e. **Fuel system service tools**



Fuel pump tester



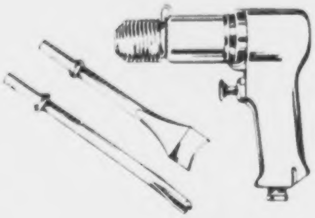
Tube flaring tool

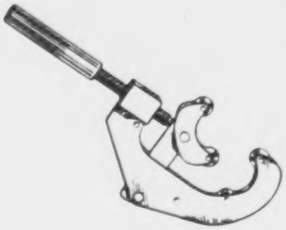


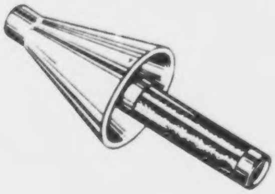
Tube cutter

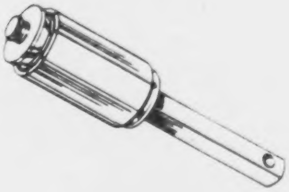
Information Sheet

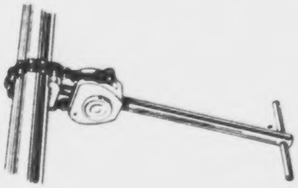
f. **Exhaust system service tools**


Power chisel

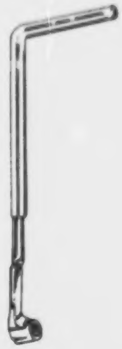

Hand pipe cutter

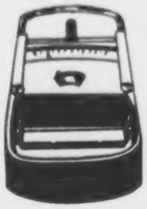

Straightening cone

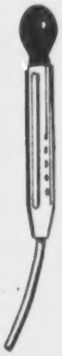

Pipe expanding tool

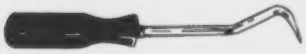

Chain wrench

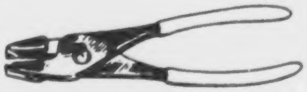
g. **Cooling system service tools**


Fan wrench

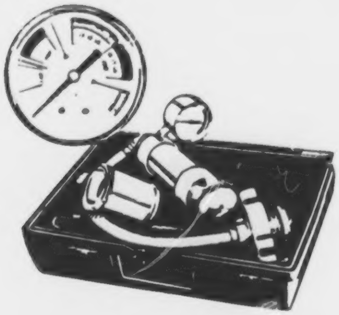

Belt tension gauge


Antifreeze tester

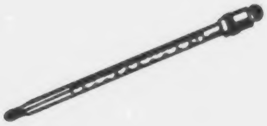

Radiator hose remover tool


Hose clamp pliers

Information Sheet

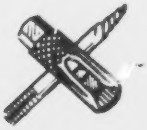


Radiator pressure tester

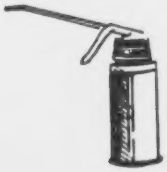


Glass thermometer

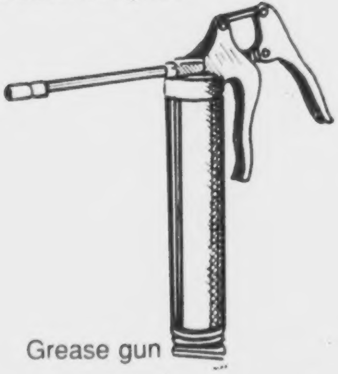
h. **Lubrication service tools**



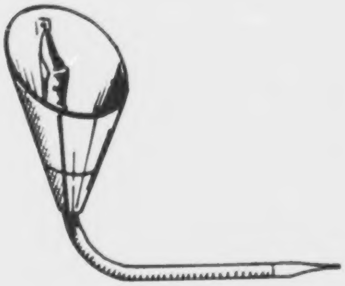
Grease fitting tool



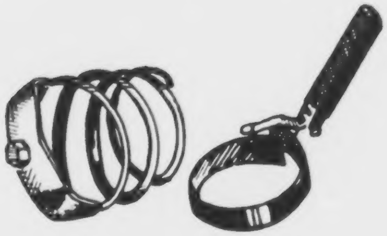
Oil can (Trigger type)



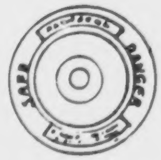
Grease gun



Transmission filler funnel



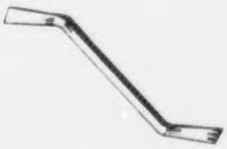
Oil filter removing tools



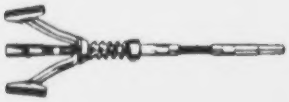
PCV tester

Information Sheet

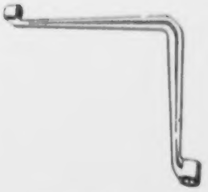
i. **Brake service tools**



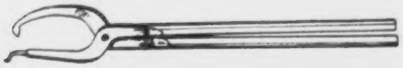
Adjusting tool



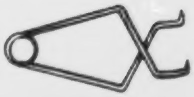
Cylinder hone



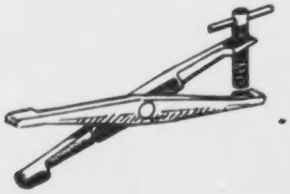
Bleeder wrench



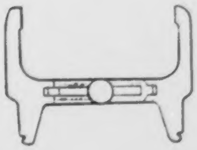
Spring pliers



Cylinder clamp

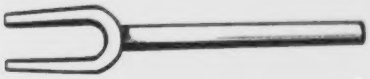


Disc brake pad spreader

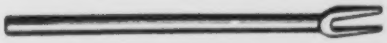


Brake shoe adjusting gauge

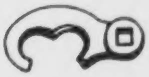
j. **Front-end service tools**



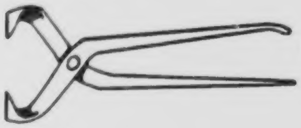
Ball joint removing tool



Tie-rod end removing tool

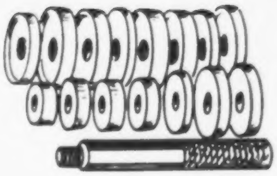


Toe-in adjusting wrench

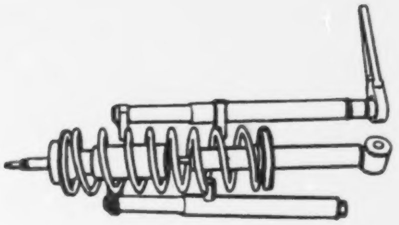


Dust cover remover

Information Sheet

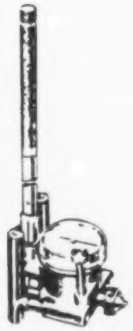


Seal driver set

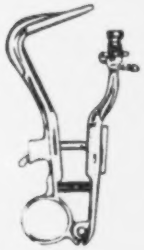


Coil spring retractor
(For McPherson struts)

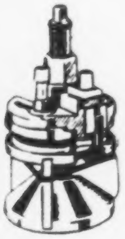
k. **Engine repair tools**



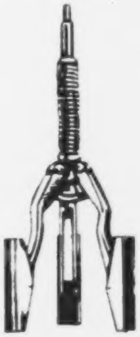
Cylinder taper gauge



Piston ring groove cleaner

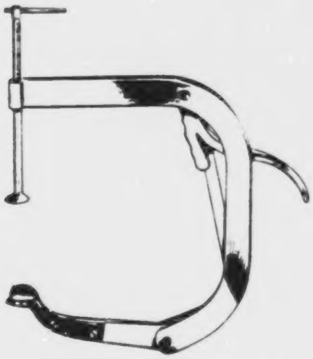


Ridge reamer

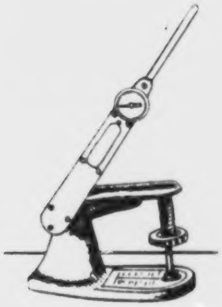


Cylinder deglazing hone

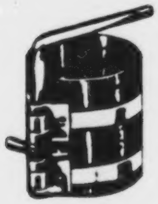
Information Sheet



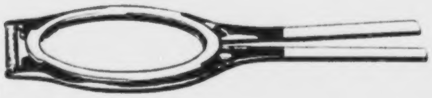
Valve spring compressor



Valve spring pressure tester

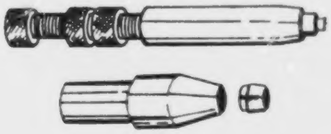


Piston ring compressor

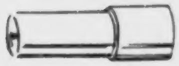


Piston ring expander

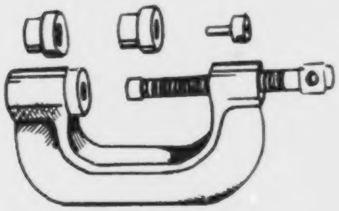
I. **Drive line tools**



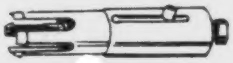
Clutch aligning set



Transmission bushing driver

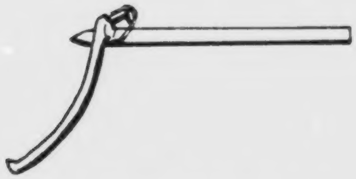


Universal joint press

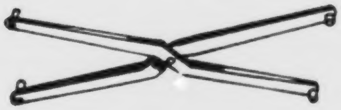


Transmission bushing puller

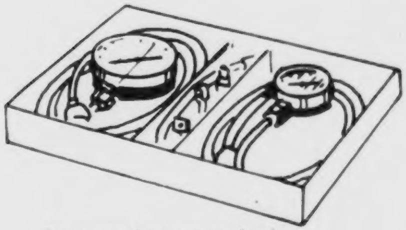
Information Sheet



Flywheel turner



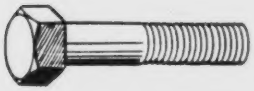
Differential adjusting tool



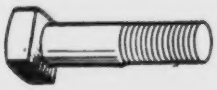
Automatic transmission
pressure gauge set

4. Types of fasteners used in automotive and small engine repair

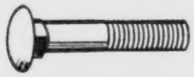
a. Bolts



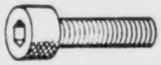
Hex head bolt



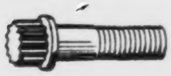
Square head cap screw



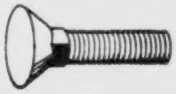
Carriage bolt



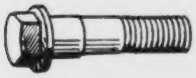
Hex socket set



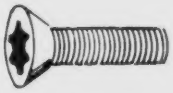
12-point head bolt



Plow bolt



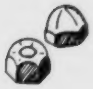
Hex flange screw

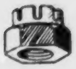


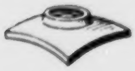
Torx head

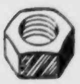
Information Sheet

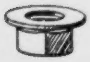
b. **Nuts**

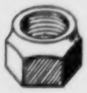

Acorn

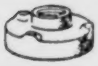

Castle

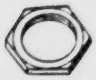

Spring

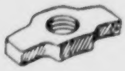

Hex

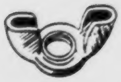

Flanged

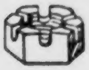

Lock

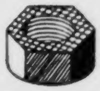

Weld

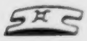

Panel


Specialty

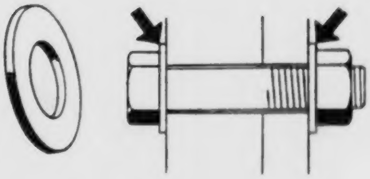

Wing

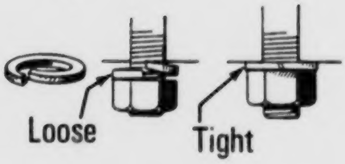

Slotted


Serrated

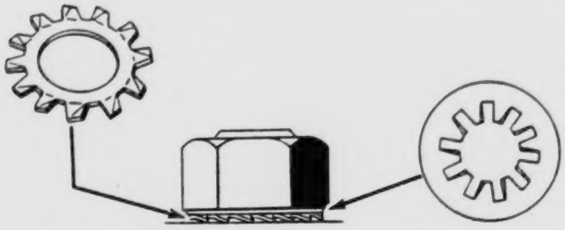

Single thread

c. **Washers**

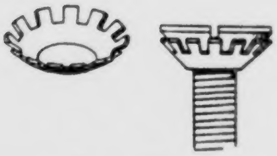

Flat



Lock

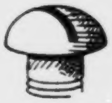

External toothed

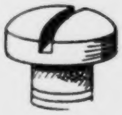
Internal toothed

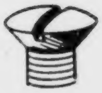

Countersunk
external toothed

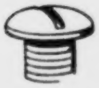
Information Sheet

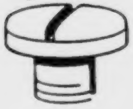
d. **Machine screw head designs**

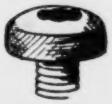

Round

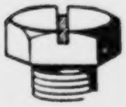

Fillister

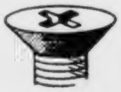

Oval

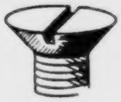

Truss


Pan

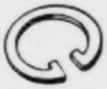

Clutch

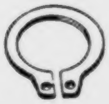

Hex slotted

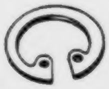

Cross recessed
or Phillips

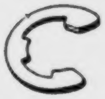

Flat

e. **Snap rings**

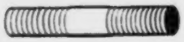

Internal prong

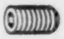

External hole

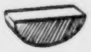

Internal hole

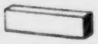

External "E"

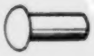
f. **Miscellaneous fasteners**

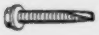

Stud

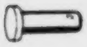

Set screw

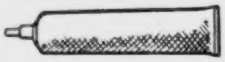

Woodruff key

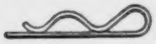

Square key

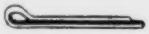

Rivet


Tapping screw


Clevis pin


Adhesive


Spring lock pin


Cotter pin

Information Sheet

5. Bolt and thread dimensions and their measurement techniques

a. Size of bolt — Determined by measuring the diameter of the thread end

b. Length of bolt — Determined by measuring the distance from bottom of the head to the end of the threads

c. Number of threads per inch — Determined by measuring with a ruler or thread gauge the number of threads per inch

Note: Coarse threads are U.S. Standard, and fine threads are Society of Automotive Engineer (S.A.E.) Standard; the three most commonly used metric bolt threads or pitches on an automobile are 1.00, 1.25, and 1.50 mm; American National Standards established the unified screw thread standard.

Tools and Fasteners
Unit 8

Assignment Sheet 1—Measure Bolts and Threads

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	______
Measurements are accurate	______

Introduction: The use of a steel rule and thread gauge to determine accurate measurements is an important part of success as a parts specialist. Determining bolt length, size, and threads per inch can help the parts specialist select the appropriate fasteners for a specific job. This exercise will help you sharpen these skills.

Directions: Using a correctly graduated rule and thread gauge, measure the bolts and threads provided by your instructor. Write your answers on the lines provided below.

1. Bolt A
   a. Size (Diameter) ______________
   b. Length ______________
   c. Threads per inch ______________
2. Bolt B
   a. Size (Diameter) ______________
   b. Length ______________
   c. Threads per inch ______________
3. Bolt C
   a. Size (Diameter) ______________
   b. Length ______________
   c. Threads per inch ______________
4. Bolt D
   a. Size (Diameter) ______________
   b. Length ______________
   c. Threads per inch ______________

Assignment Sheet 1

5. Bolt E

   a. Size (Diameter) ____________________
   b. Length ____________________
   c. Threads per inch ____________________

6. Bolt F

   a. Size (Diameter) ____________________
   b. Length ____________________
   c. Threads per inch ____________________

7. Bolt G

   a. Size (Diameter) ____________________
   b. Length ____________________
   c. Threads per inch ____________________

8. Bolt H

   a. Size (Diameter) ____________________
   b. Length ____________________
   c. Threads per inch ____________________

Measuring
Unit 9

Objective Sheet

Unit Objective

After completing this unit, the student should be able to read and use common measuring devices. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to measuring with their correct definitions.
2. Select basic units of measurement found on rules.
3. Identify types of rules used by a parts specialist.
4. Select true statements concerning guidelines for using rules.
5. Identify the parts of an outside micrometer.
6. Explain how to select the proper size outside micrometer.
7. Select true statements concerning methods for checking accuracy of an outside micrometer.
8. Identify the parts of an inside micrometer.
9. List uses of an inside micrometer.
10. Identify accessories used with an inside micrometer.
11. Select true statements concerning methods for checking accuracy of an inside micrometer.
12. Select true statements concerning rules for use and care of micrometers.
13. Identify the parts of a dial caliper.
14. Select true statements concerning guidelines for care of dial calipers.
15. List four parts of a torque wrench.

Objective Sheet

16. List two basic types of feeler gauges.
17. Read U.S. customary and metric rules. (Assignment Sheet 1)
18. Draw lines to specified lengths. (Assignment Sheet 2)
19. Measure lines using a steel rule. (Assignment Sheet 3)
20. Measure lines on objects. (Assignment Sheet 4)
21. Measure the diameter of a circle. (Assignment Sheet 5)
22. Read standard and metric micrometers. (Assignment Sheet 6)
23. Use inside and outside micrometers. (Job Sheet 1)
24. Use a dial caliper. (Job Sheet 2)
25. Use telescoping gauges. (Job Sheet 3)
26. Use a dial indicator. (Job Sheet 4)

Measuring
Unit 9

Suggested Activities

Instructional Plan

Preparation

- Review the unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Review suggested supplemental resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Arrange for a local parts dealer to visit the class to discuss this unit and its application to the work of a parts specialist.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Teaching Suggestions

Objective 1 Match terms related to measuring with their correct definitions.

Suggested Activities

- Read and discuss terms and definitions. **(Listening for content; orally expressing a thought)**

Objective 2 Select basic units of measurement found on rules.

- Using Transparencies 1 through 7, discuss the need for rules graduated in the various units of measurement. **(Listening for content)**
- Assign the class members to do various measuring projects using the different rules. **(Adapting to the organization's values and cultures)**
- Hand out Assignment Sheet 1, "Read U.S. Customary and Metric Rules." Discuss the introduction and the steps in reading rules. Read the directions, answer any questions, and have students complete this activity. **(Reading/listening for content; applying math skills)**
- Distribute Assignment Sheets 2 through 5. Read the directions, answer any questions, and have students complete and turn in for evaluation. **(Reading/listening for content; applying math skills)**

Objective 3 Identify types of rules used by a parts specialist.

- Using Transparency 8, lead the class in a discussion of the various types of rules used in shops and stores. If possible, have examples of each type of rule for the class members to examine. Ask class members why some rules would be better suited to some jobs than others. **(Listening for content; orally communicating a thought; critical thinking)**

Objective 4 Select true statements concerning guidelines for using rules.

- Discuss with the class the various guidelines for obtaining accurate readings with rules. **(Listening for content)**

Objective 5 Identify the parts of an outside micrometer. **Objective 6** Explain how to select the proper size outside micrometer. **Objective 7** Select true statements concerning methods for checking accuracy of an outside micrometer.

- Using Transparencies 9 and 10, along with examples of outside micrometers, lead the class through the objectives, allowing each student to see, touch, and use a micrometer to become familiar with it. **(Listening for content; learning to learn)**

Suggested Activities

- Discuss the various types of micrometers, explaining that there are direct reading, dual reading, dial indicating, and electronic micrometers. Show examples of the various types if available. Discuss advantages of each type. **(Listening for content; learning to learn)**

Objective 8 Identify the parts of an inside micrometer. **Objective 9** List uses of an inside micrometer. **Objective 10** Identify accessories used with an inside micrometer. **Objective 11** Select true statements concerning methods for checking accuracy of an inside micrometer. **Objective 12** Select true statements concerning rules for use and care of micrometers.

- Using Transparencies 11 through 13, and examples of an inside micrometer and its accessories, lead the class through the objectives, allowing each student to see, touch, and use an inside micrometer to become familiar with it. **(Listening for content; learning to learn)**
- Show students different-sized inside and outside micrometers. Then show them various items to be measured and let them determine which micrometer to use. **(Listening for content; problem solving)**
- Hand out Assignment Sheet 6, "Read Standard and Metric Micrometers." Discuss the introduction and steps in reading micrometers and review the place values of decimal numbers. Then, read the directions, answer any student questions, and have students complete the assignment. **(Reading/listening for content; orally communicating a thought; applying math skills)**

Objective 13 Identify the parts of a dial caliper. **Objective 14** Select true statements concerning guidelines for care of dial calipers.

- Using Transparency 14, discuss the parts of a dial caliper. Show an actual dial caliper to class and explain how it is used. **(Listening for content)**
- Demonstrate the proper use of a dial caliper. Have students practice the use of this measuring device. **(Listening for content; learning to learn)**
- Show students how to care for a dial caliper. Emphasize the importance of properly storing this device. **(Listening for content; adapting to the organization's values and traditional modes of operation)**

Suggested Activites

- Hand out Job Sheet 2, "Use a Dial Caliper." Read and discuss directions with students. Answer any questions, then have students complete this activity. **(Reading/listening for content; orally communicating a thought; applying math skills)**

- Hand out Job Sheet 3, "Use Telescoping Gauges." Read and discuss directions with students. Demonstrate how to use a telescoping gauge, then have students practice using a telescoping gauge. Answer any questions, then have students complete this activity. **(Reading/listening for content; orally communicating a thought; applying math skills)**

- Hand out Job Sheet 4, "Use a Dial Indicator." Read and discuss information with students. Demonstrate how to use a dial indicator using the procedures outlined in the job sheet. Have students practice by measuring objects in shop. Answer any questions, then have students complete this activity. **(Reading/listening for content; orally communicating a thought; applying math skills)**

Objective 15 List four parts of a torque wrench. **Objective 16** List two basic types of feeler gauges.

- Read and discuss information dealing with torque wrenches and feeler gauges. Use Transparency 15 to show parts of a torque wrench. Provide class with examples of these instruments and show how they are used. Provide class props, such as small engine head bolts to torque, spark plug electrodes to gap, etc. to allow students to have hands on experience with each of these tools. **(Reading/listening for content; applying math skills)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job-sheet scores on "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- Busch, Ted. *Fundamentals of Dimensional Metrology.* Albany, NY: Wilkie Brothers Foundation, Delmar Publishers, Inc.
- Crouse, William H. and Donald L. Anglin. *Small Engine Mechanics.* New York: McGraw-Hill Book Co., Inc.
- Feirer, John Louis and Earl E. Tetro. *Machine Tool Metalworking: Principles and Practice.* New York: McGraw-Hill Book Co., Inc.
- *How to Read, Use and Care for Micrometers and Vernier Gauges.* Athol, MA: L.S. Starrett Co.
- Johnson, Harold V. *General Industrial Machine Shop,* rev. Peoria, IL: Charles Bennett Publishing Co.
- Ludwig, Oswald and Willard McCarthy. *Metalwork Technology and Practice.* Bloomington, IL: McKnight and McKnight Publishing Co.
- Porter, Harold, O. D. Lascoe, and Clyde Nelson. *Machine Shop Operations and Setups,* 3rd ed. Chicago: American Technical Society.
- Repp, Victor E., and Willard McCarthy. *Machine Tool Technology.* Bloomington, IL: McKnight Publishing Co.
- *The Tools and Rules for Precision Measuring.* Athol, MA: L. S. Starrett Co.
- *Small Engine Repair.* Stillwater, OK: Mid-America Vocational Curriculum Consortium, 1985.

Supplemental Resources

- *Kohler Engine's Measurement Guide.* Kohler, WI: Engine Division, Kohler Co., n.d.

  This publication is a 14-page training guide to be used as a teaching aid for instruction in the proper use of measuring devices as applied to the inspection of Kohler air-cooled-engine components.

Suggested Activities

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.
- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

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Measuring
Unit 9

Answers to Assignment Sheets

Assignment Sheet 1

Part A

1. a. 1/4"
   b. 1/2"
   c. 1 1/4"
   d. 1 3/4"
   e. 1 1/4"
   f. 2 1/2"
   g. 1 1/4"
   h. 2 1/2"
   i. 1 1/2"
   j. 4"

2. a. 3/8"
   b. 1/4"
   c. 1 1/8"
   d. 3/4"
   e. 1 1/2"
   f. 2 3/4"
   g. 1/2"
   h. 2"
   i. 4 1/4"
   j. 2 3/8"

3. a. 15/16"
   b. 1/2"
   c. 1 13/16"
   d. 3/4"
   e. 1 11/16"
   f. 3 5/16"
   g. 1 1/2"
   h. 2 5/8"
   i. 4 1/4"
   j. 1 5/8"

4. a. 25/32"
   b. 1 5/32"
   c. 3/8"
   d. 1 27/32"
   e. 1 9/16"
   f. 1 1/2"
   g. 1 3/16"
   h. 2 13/16"
   i. 4 9/32"
   j. 1 15/16"

Part B

1. a. .08"
   b. .40"
   c. .58"
   d. .80"
   e. 1.28"
   f. .09"
   g. .38"
   h. .84"
   i. 1.07"
   j. 1.45"

2. a. .15"
   b. .50"
   c. 1.25"
   d. 1.80"
   e. 2.85"
   f. 3.95"
   g. 4.35"
   h. 4.95"
   i. 5.35"
   j. 5.85"

Part C

1. 5 mm
2. 20 mm
3. 37 mm
4. 49 mm
5. 73 mm
6. 6.5 mm
7. 17.5 mm
8. 30.5 mm
9. 50.5 mm
10. 69.5 mm

Answers to Assignment Sheets

Assignment Sheet 2 — Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 3

1. a. 3 1/4
   b. 4 1/2
   c. 1
   d. 2

2. a. 4 7/8
   b. 2 1/2
   c. 3 5/8
   d. 4 1/4

3. a. 4 5/8
   b. 1 1/16
   c. 2 5/8
   d. 3 1/4

4. a. 4 29/32
   b. 3 15/32
   c. 2
   d. 4 1/16

5. a. 2 3/4
   b. 3 33/64
   c. 4 1/8
   d. 1 33/64

6. a. 3 cm
   b. 6 cm
   c. 1 cm
   d. 12 cm

7. a. 21 mm
   b. 53 mm
   c. 100 mm
   d. 12 mm

Answers to Assignment Sheets

Assignment Sheet 4

1. a. 23/32
   b. 19/32
   c. 31/64
   d. 53/64
   e. 19/64
   f. 21/32
   x. 2 5/8
   y. 64/64

2. k. 3/32
   l. 2 9/64
   m. 43/64
   z. 2 57/64

3. e. 55/64
   f. 31/64
   g. 31/64
   h. 51/64
   y. 2 5/8

4. t. 51/64
   u. 1 21/32
   v. 51/64
   y. 2 15/64
   z. 3 15/64
   j. 13/32
   i. 13/32
   w. 13/16

Assignment Sheet 5

1. 1 1/2
2. 49/64
3. 37/64
4. 1 23/64
5. 55/64
6. 1 17/64
7. 1 13/64
8. 33/64
9. 31/32

Assignment Sheet 6

Part A

1. 0.223″
2. 0.949″
3. 0.520″
4. 0.388″
5. 0.157″
6. 0.520″
7. 0.589″
8. 0.083″
9. 0.738″
10. 0.808″
11. 0.797″
12. 0.008″
13. 0.679″
14. 0.022″

Answers to Assignment Sheets

Part B

1. 17.76 mm
2. 4.33 mm
3. 22.43 mm
4. 5.69 mm
5. 3.71 mm
6. 0.07 mm
7. 14.44 mm
8. 18.07 mm
9. 11.07 mm
10. 18.78 mm

Measuring
Unit 9

Answers to Written Test

1.
   - a. 4
   - b. 6
   - c. 10
   - d. 2
   - e. 5
   - f. 8
   - g. 3
   - h. 9
   - i. 7
   - j. 1

2.
   - a. D
   - b. F
   - c. M
   - d. F
   - e. D
   - f. M
   - g. M
   - h. F
   - i. F
   - j. M

3.
   - a. Narrow flexible rule
   - b. Dial indicator caliper rule
   - c. Slide caliper rule
   - d. Steel rule
   - e. Vernier caliper rule

4. a, b,d, h

5.
   - a. Frame
   - b. Anvil
   - c. Spindle
   - d. Lock
   - e. Sleeve
   - f. Ratchet stop
   - g. Thimble

6. Answer should include the following:

   - a. Determine the approximate size of the workpiece.
   - b. Observe the capacity of the outside micrometer on the frame.

7. b, c

8.
   - a. Body
   - b. Anvil
   - c. Thimble
   - d. Handle
   - e. Rod
   - f. Lock screw

Answers to Written Test

9. a. Measure inside diameter.
   b. Measure width.
   c. Measure height.
   d. Transfer measurement to outside spring-joint caliper.

10. a. Height gauge base
    b. Wrench
    c. Extension handle
    d. Extension collar
    e. Base unit

11. b, c

12. a, b, d, e, f

13. a. Dial
    b. Clamp screw
    c. Scale
    d. Fine adjustment nut
    e. Movable jaw
    f. Fixed jaw

14. a, d

15. a. Socket head
    b. Beam
    c. Scale
    d. Handle

16. a. Blade
    b. Wire

Measuring
Unit 9

Written Test

Name ______________________ Score __________

1. Match terms related to measuring with their correct definitions. Write the numbers on the blanks provided below.

_____a. A sense of touch developed to such a degree that two people can measure a workpiece and arrive at measurements that are exactly the same

_____b. Instrument used to measure accurately to 0.001 inch or 0.01 millimeter

_____c. Instrument used to measure the internal diameter of parts; range in size from $^{5}/_{16}$ inch to 6 inches

_____d. Precision instrument designed to measure small amounts of movement; may be graduated in thousandths of an inch or hundredths of a millimeter

_____e. Marking found on rules and scales to denote unit of length, diameter, or torque

_____f. Accurate or true measure

_____g. Mistake in the reading or total measurement

_____h. Semi-precision instrument graduated in fractional or decimal parts of an inch or metric measure

_____i. Starting point of measurement for both workpiece and rule

_____j. Instrument used to make high-precision measurements; can take both inside and outside measurements of parts and components

1. Dial caliper
2. Dial indicator
3. Error
4. Feel
5. Graduation
6. Micrometer
7. Reference point
8. Reliable measure
9. Steel rule
10. Telescoping gauge

Written Test

2. Select basic units of measurement found on rules by placing an "F" next to fractional units, a "D" next to decimal units, and an "M" next to metric units.

_______a. Tenths

_______b. Sixty-fourths

_______c. Decimeter

_______d. Thirty-seconds

_______e. Hundredths

_______f. Centimeter

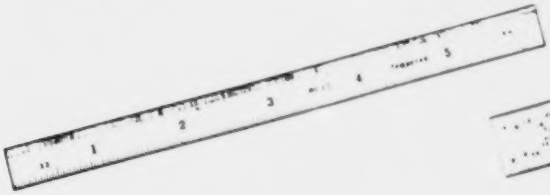
_______g. Meter

_______h. Eighths

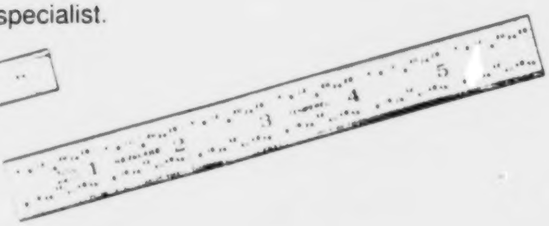
_______i. Sixteenths

_______j. Millimeter

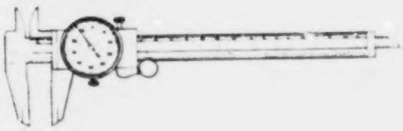
3. Identify types of rules used by a parts specialist.



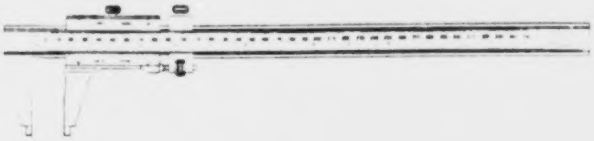
a. ______________________________



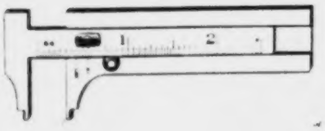
d. ______________________________



b. ______________________________



e. ______________________________



c. ______________________________

Written Test

4. Select true statements concerning guidelines for using rules by placing an "X" in the appropriate blanks.

_______a. Use the proper length and graduation.

_______b. Use finest graduation for accuracy.

_______c. Use a fair quality rule.

_______d. Do not bend or distort a steel rule.

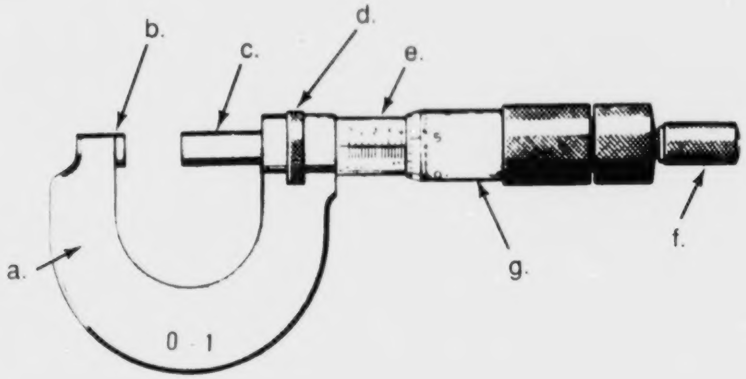
_______e. Use rule for measuring and scraping parts.

_______f. Use quarter unit graduation as reference for accuracy.

_______g. Use rule flat on surface for better reading.

_______h. Use rule along axis parallel to plane of measure.

5. Identify the parts of an outside micrometer.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

g. ____________________

Written Test

6. Explain how to select the proper size outside micrometer.

____

____

____

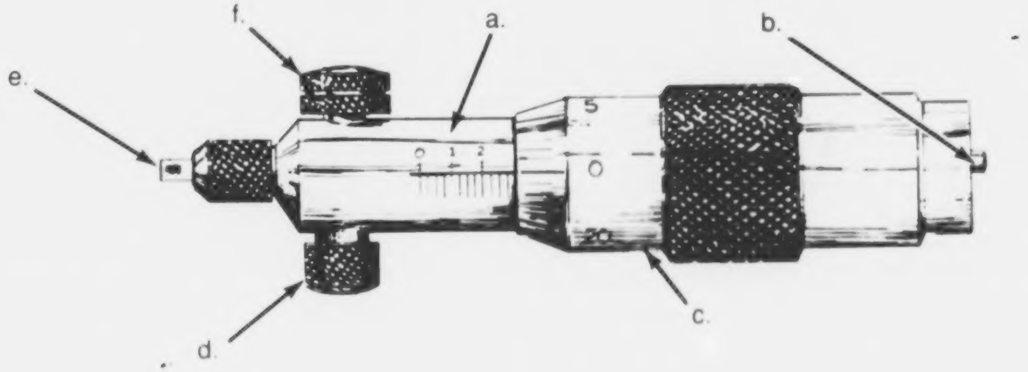
7. Select true statements concerning methods for checking accuracy of an outside micrometer by placing an "X" in the appropriate blanks.

______a. Do not close spindle and anvil together.

______b. Observe zero references on the sleeve and thimble.

______c. Use a standard bar or disc to check the minimum capacity.

8. Identify the parts of an inside micrometer.



a. ____________________

b. ____________________

c. ____________________

d. ____________________

e. ____________________

f. ____________________

Written Test

9. List uses of an inside micrometer.

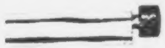
a. ____

b. ____

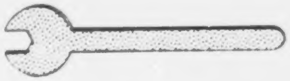
c. ____

d. ____

10. Identify accessories used with an inside micrometer.

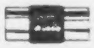


a. ____________________

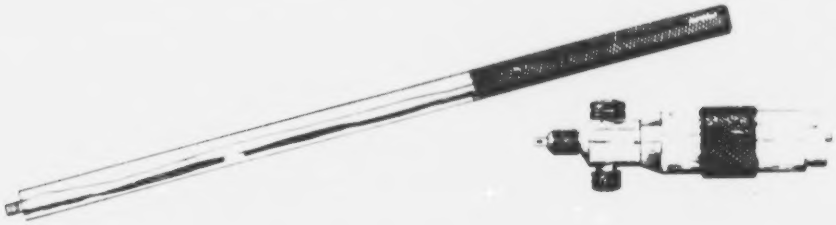


b. ____________________

c. ____________________



d. ____________________



e. ____________________

f. ____________________

11. Select true statements concerning methods for checking accuracy of an inside micrometer by placing an "X" in the appropriate blanks.

______a. Measure the zero reference of an inside micrometer with another inside micrometer.

______b. Measure an object of known accurate measurement or use a standard ring gauge.

______c. Use a gauge block holder and gauge blocks to check an extension bar measurement.

Written Test

12. Select true statements concerning rules for use and care of micrometers by placing an "X" in the appropriate blanks.

_____a. If the micrometer needs cleansing, wipe it with light machine oil and a soft, lit-free cloth.

_____b. Check the instrument for accuracy before use.

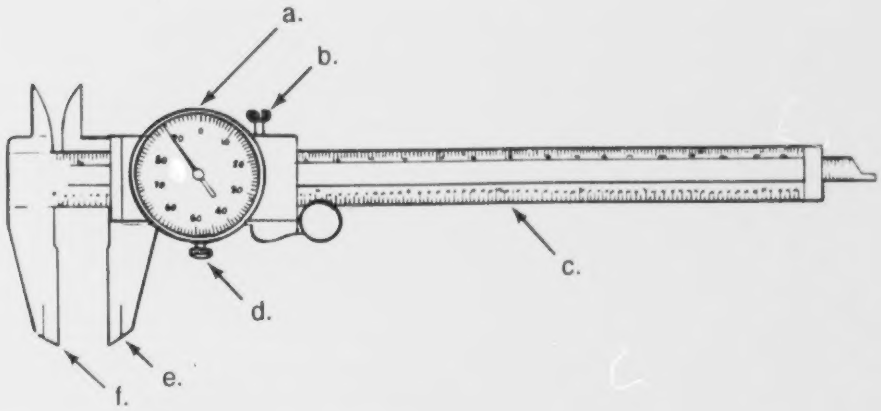
_____c. There is no danger of overtightening a micrometer.

_____d. Keep the micrometer in its case or box when it is not being used, and do not store it with other tools.

_____e. Handle the instrument in the correct manner.

_____f. Use instrument only for intended purpose.

13. Identify the parts of a dial caliper.



a. ____________________ d. ____________________

b. ____________________ e. ____________________

c. ____________________ f. ____________________

Written Test

14. Select true statements concerning guidelines for care of dial calipers by placing an "X" in the appropriate blanks.

_______a. Keep the dial caliper free of dust, grit, and grease.

_______b. Clean the dial caliper with light machine oil and a shop rag.

_______c. Keep the dial caliper in its case when it is not being used, and store it with other tools.

_______d. When storing, leave a gap between the fixed and movable jaws to allow for the expansion and contraction of the metal in the caliper.

15. List four parts of a torque wrench.

a. ____

b. ____

c. ____

d. ____

16. List two basic types of feeler gauges.

a. ____

b. ____

***Permission to duplicate this test is granted.**

Measuring
Unit 9

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Read U.S. Customary and Metric Rules Rating ______

Comments: ______________________________

____

Assignment Sheet 2—Draw Lines to Specified Lengths Rating ______

Comments: ______________________________

____

Assignment Sheet 3—Measure Lines Using a Steel Rule Rating ______

Comments: ______________________________

____

Assignment Sheet 4—Measure Lines on Objects Rating ______

Comments: ______________________________

____

Assignment Sheet 5—Measure the Diameter of a Circle Rating ______

Comments: ______________________________

____

Assignment Sheet 6—Read Standard and Metric Micrometers Rating ______

Comments: ______________________________

____

Unit Evaluation Form

Job Sheet 1—Use Inside and Outside Micrometers Rating ______

Comments: ______________________________

____

Job Sheet 2—Use a Dial Caliper Rating ______

Comments: ______________________________

____

Job Sheet 3—Use Telescoping Gauges Rating ______

Comments: ______________________________

____

Job Sheet 4—Use a Dial Indicator Rating ______

Comments: ______________________________

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ______________________________

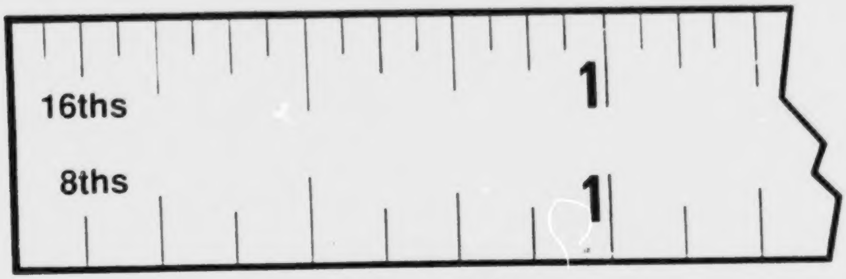
____

Teacher Signature ______________________ Date __________

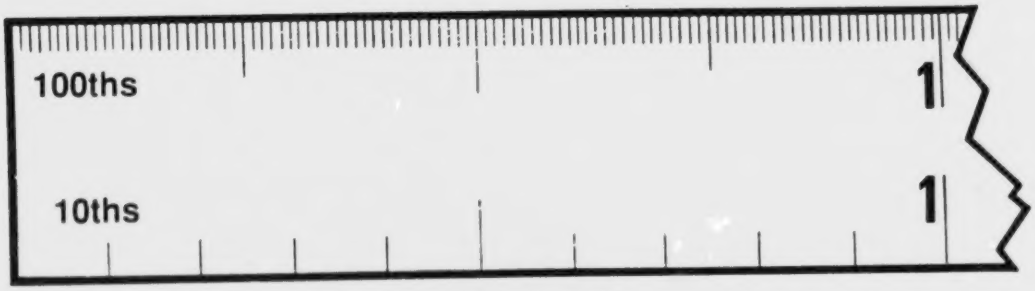
Student Signature ______________________ Date __________

***Permission to duplicate this form is granted.**

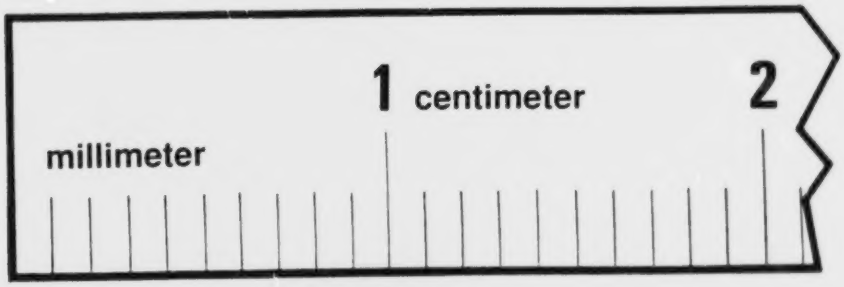
Units of Measurement


16ths
1
8ths
1

Fractional Rule


100ths
1
10ths
1

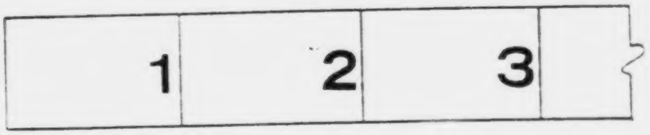
Decimal Rule


1
centimeter
2
millimeter

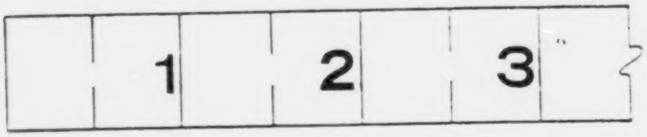
Metric Rule

Graduations on a Rule

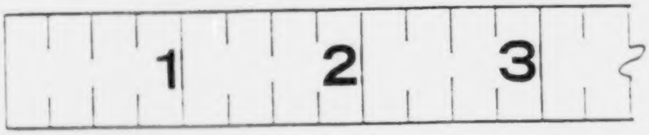
Inches



Halves

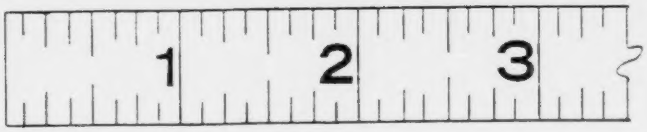


Quarters or Fourths

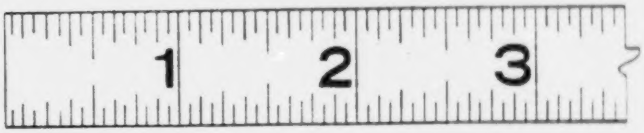


Fractional Units on a Rule

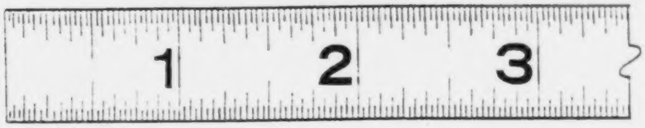
Eighths



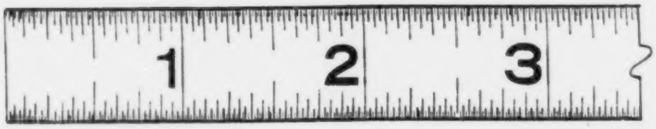
Sixteenths



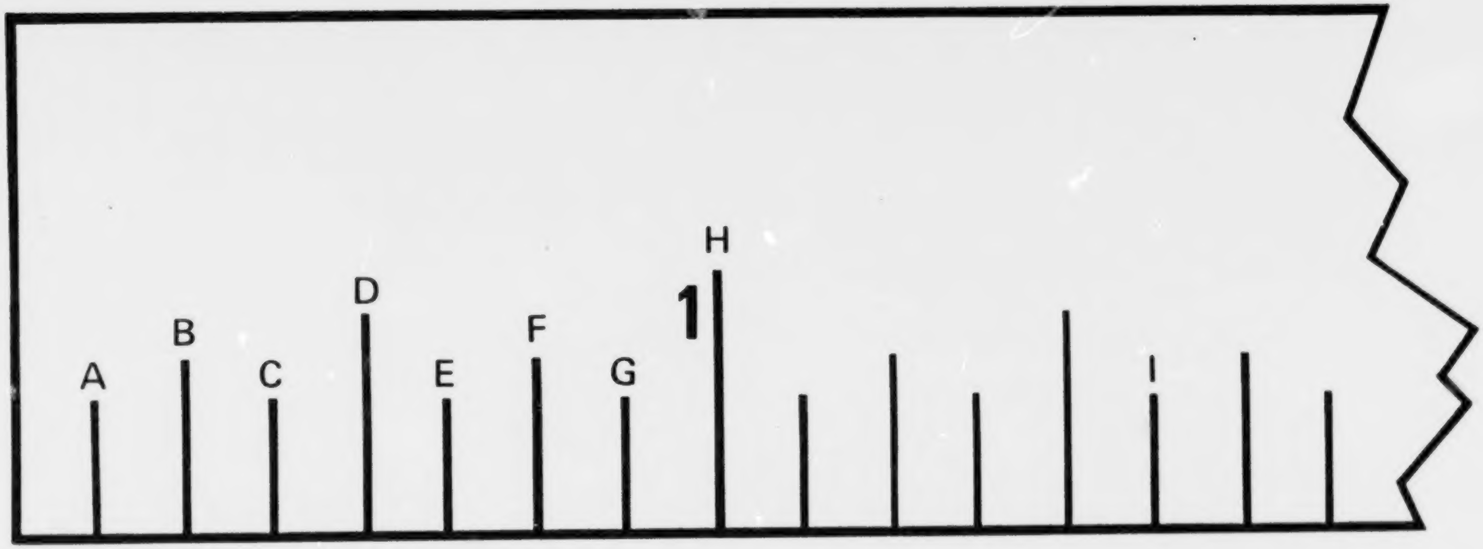
Thirty-Seconds



Sixty-Fourths

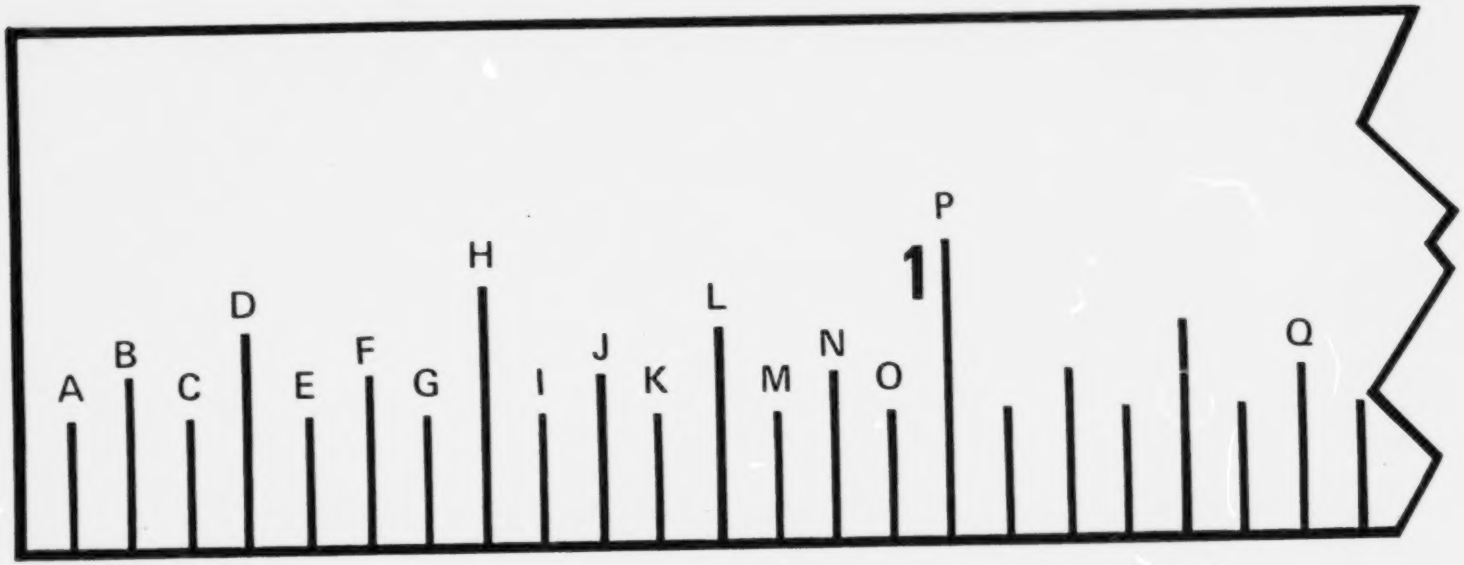


Eighths Rule



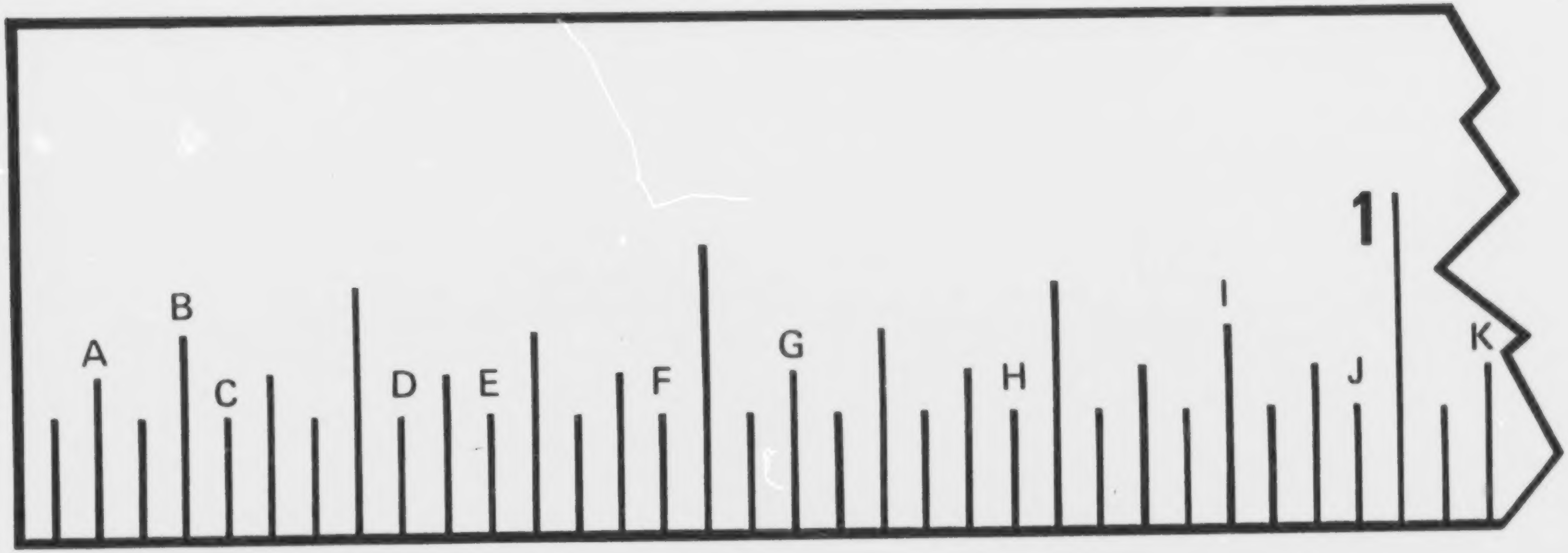
A = 1/8, B = 2/8 = 1/4, C = 3/8, D = 4/8 = 1/2,
E = 5/8, F = 6/8 = 3/4, G = 7/8, H = 8/8 = 1,
I = 13/8 = 1 5/8

Sixteenths Rule


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
1
P
Q

A = 1/16, B = 2/16 = 1/8, C = 3/16, D = 4/16 = 1/4,
E = 5/16, F = 6/16 = 3/8, G = 7/16, H = 8/16 = 1/2,
I = 9/16, J = 10/16 = 5/8, K = 11/16, L = 12/16 = 3/4,
M = 13/16, N = 14/16 = 7/8, O = 15/16, P = 16/16 = 1,
Q = 22/16 = 1 6/16 = 1 3/8

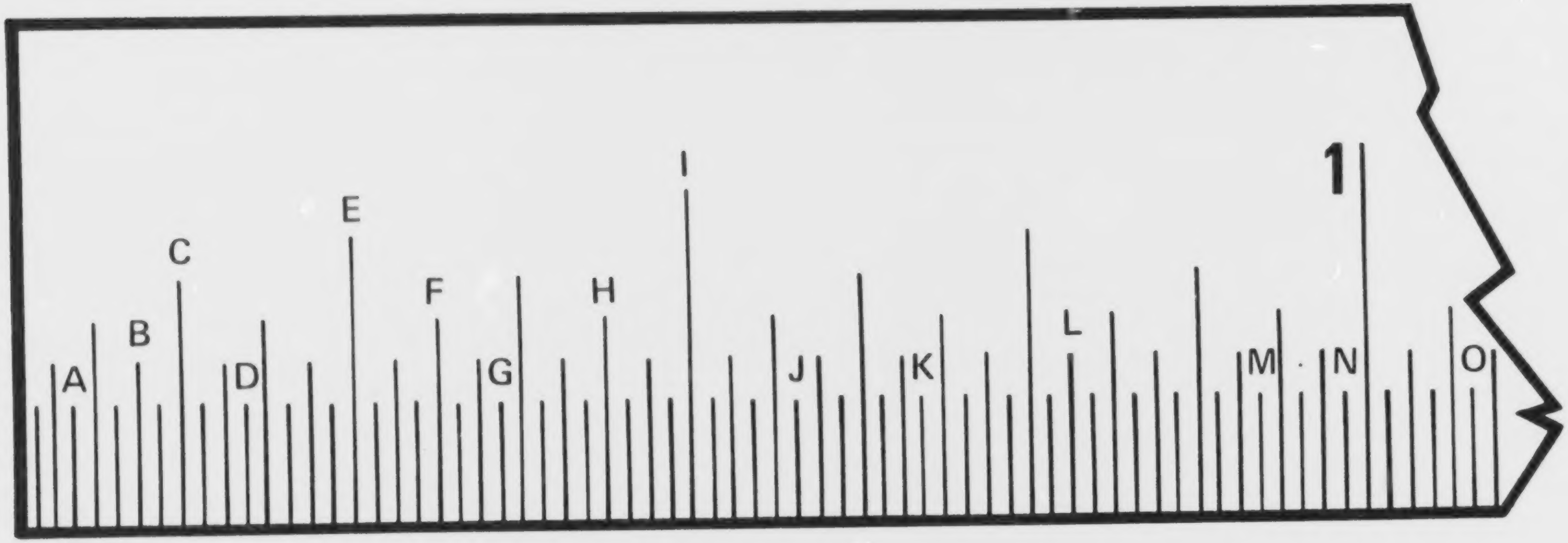
Thirty-Seconds Rule



A = 2/32 = 1/16, B = 4/32 = 1/8, C = 5/32, D = 9/32,
E = 11/32, F = 15/32, G = 18/32 = 9/16, H = 23/32,
I = 28/32 = 14/16 = 7/8, J = 31/32,
K = 34/32 = 1 2/32 = 1 1/16

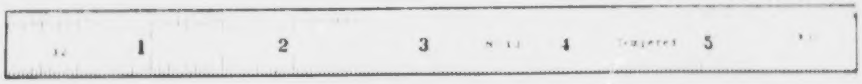
Sixty-Fourths Rule

Parts Specialist Unit 9
Teacher Page 35

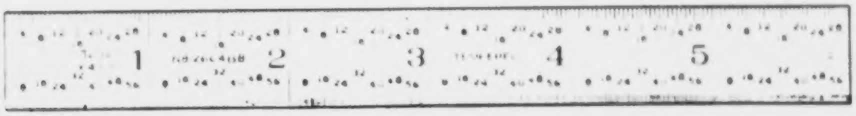


A = 3/64, B = 6/64 = 3/32, C = 8/64 = 1/8, D = 11/64,
E = 16/64 = 8/32 = 1/4, F = 20/64 = 10/32 = 5/16,
G = 23/64, H = 28/64 = 14/32 = 7/16, I = 32/64 = 1/2,
J = 37/64, K = 43/64, L = 50/64 = 25/32, M = 59/64,
N = 63/64, O = 69/64 = 1 5/64

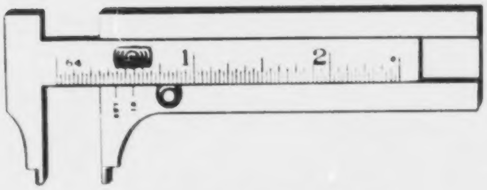
Types of Rules



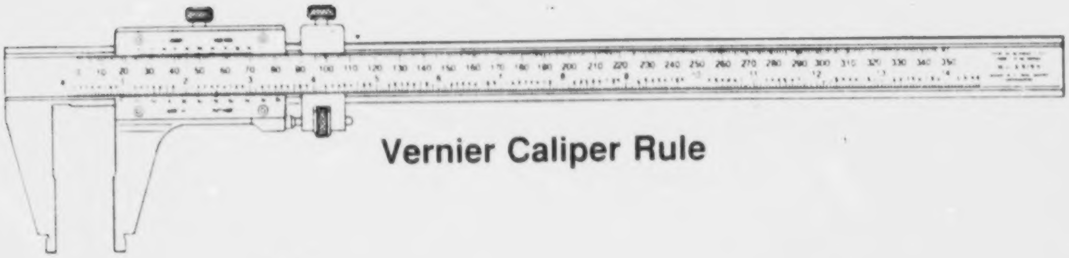
Narrow Flexible Rule



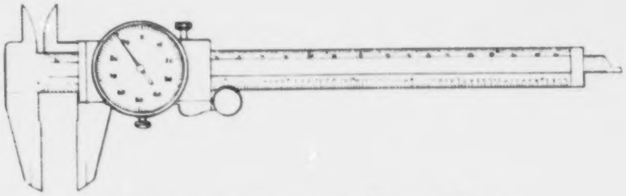
Steel Rule



Slide Caliper Rule

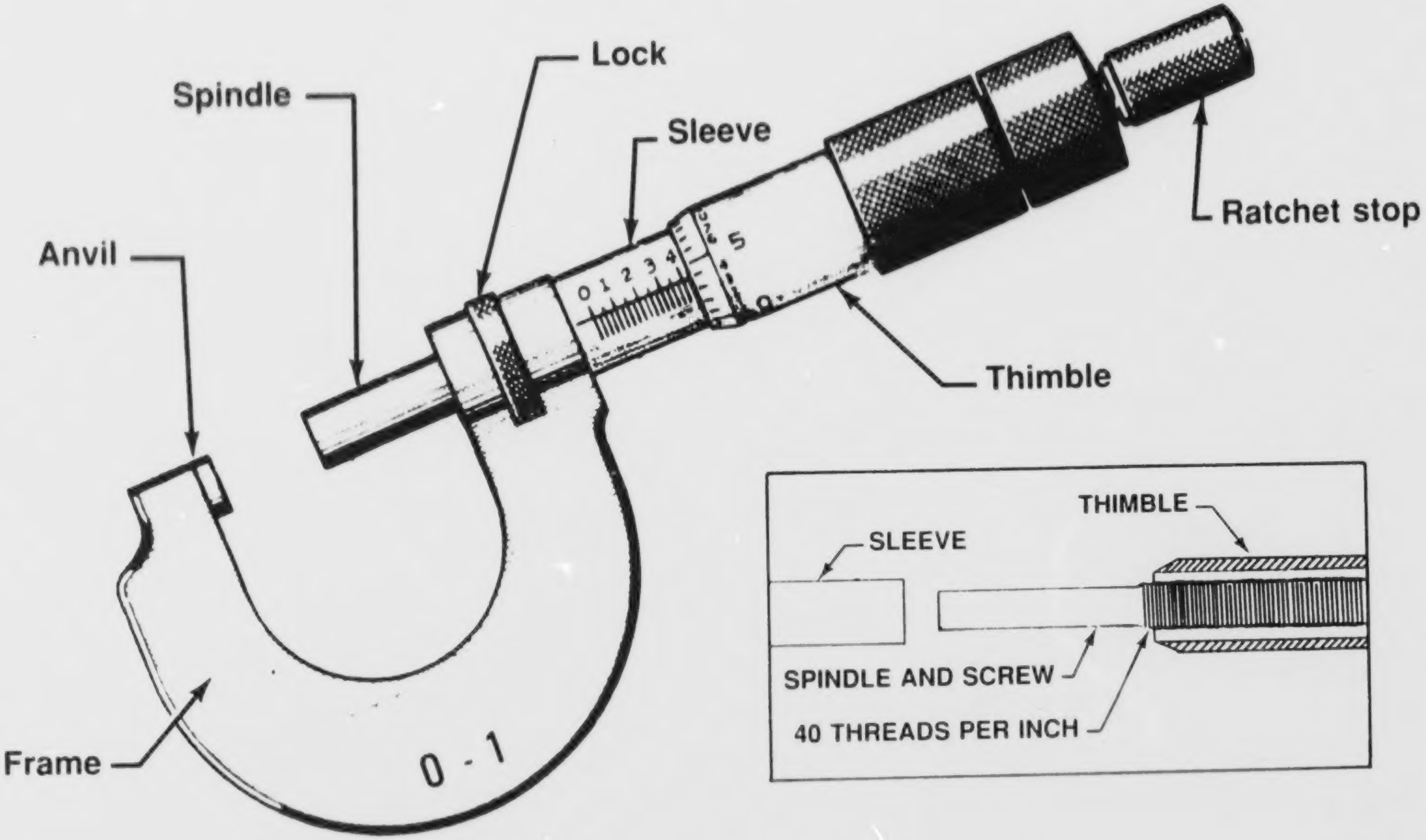


Vernier Caliper Rule



Dial Indicator Caliper Rule

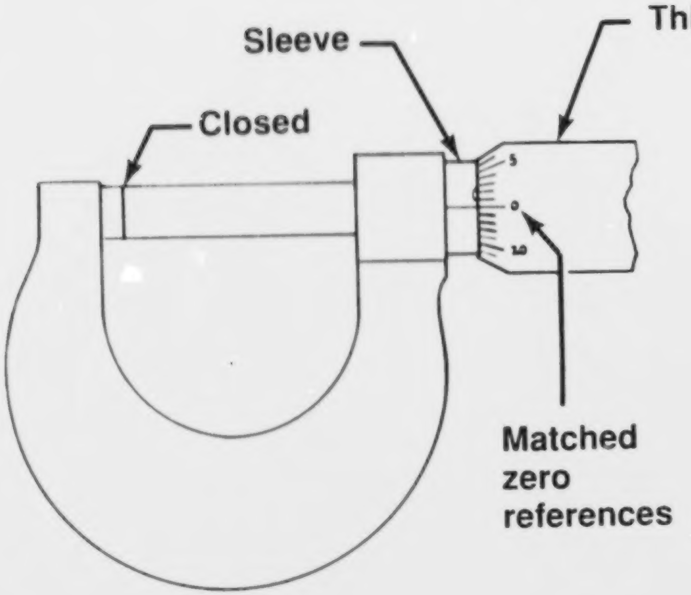
Parts of an Outside Micrometer


Lock
Spindle
Sleeve
Anvil
5
0 1 2 3 4
0
Ratchet stop
Thimble
Frame
0 - 1
THIMBLE
SLEEVE
SPINDLE AND SCREW
40 THREADS PER INCH

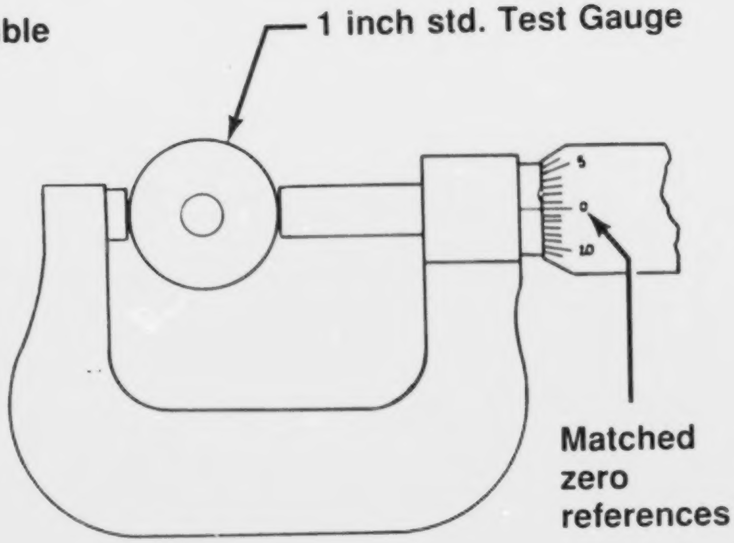
Parts Specialist, Unit 9
Teacher Page 39

TM 9

Checking the Micrometer for Accuracy

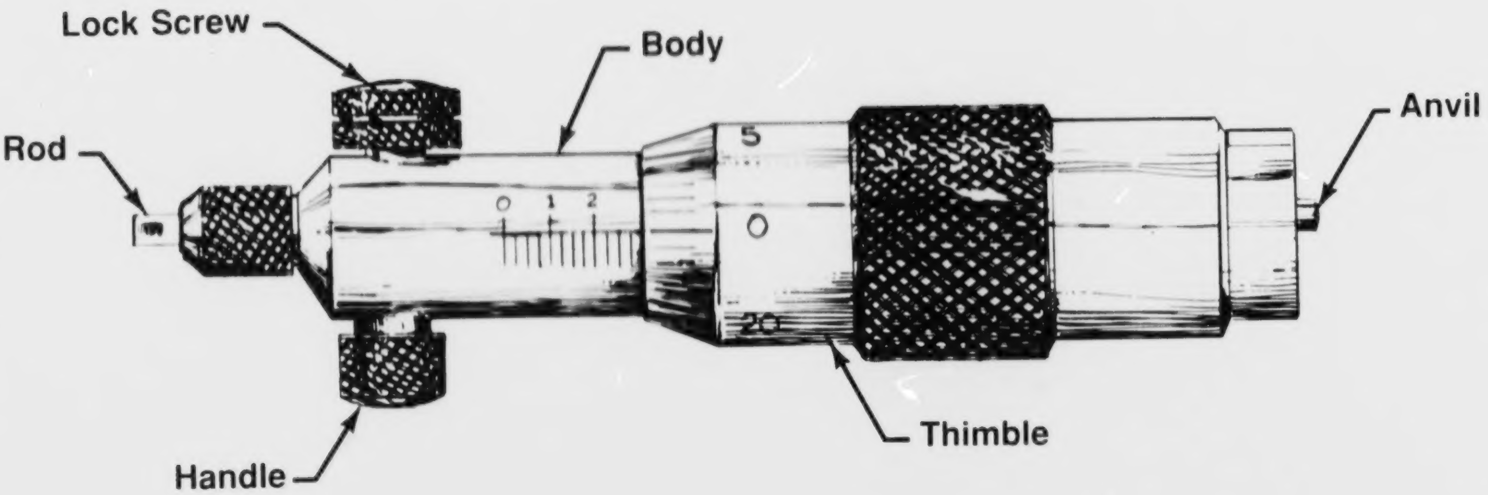

Sleeve
Thimble
Closed
5
0
10
Matched zero references

1 INCH MICROMETER


1 inch std. Test Gauge
5
0
10
Matched zero references

1 INCH MICROMETER

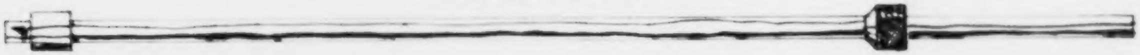
Parts of an Inside Micrometer

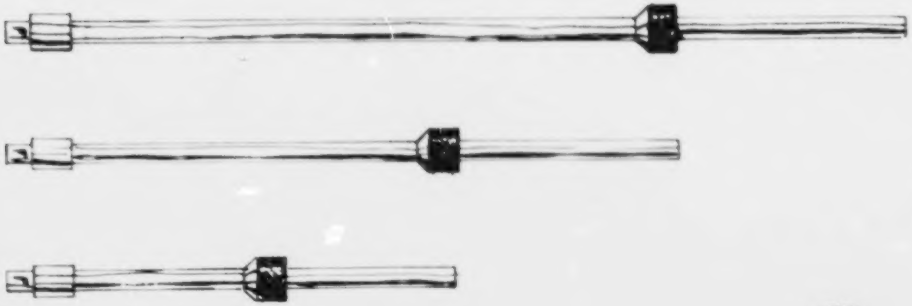

Lock Screw
Body
Anvil
Rod
5
0 1 2
0
20
Thimble
Handle

Parts Specialist: Unit 9
Teacher Page 43

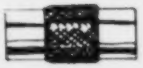
TM 11

Accessories Used With an Inside Micrometer

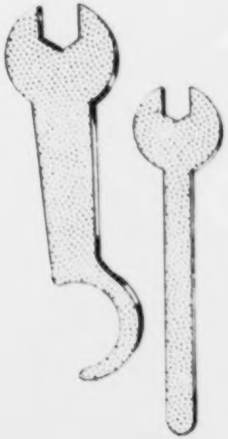




Extension Rods

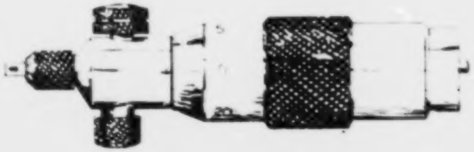


Extension Collar

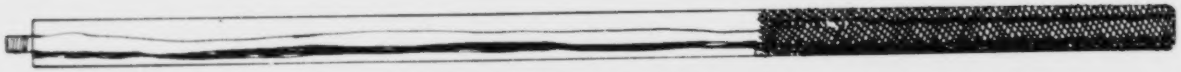


Wrenches

Height Gauge Base

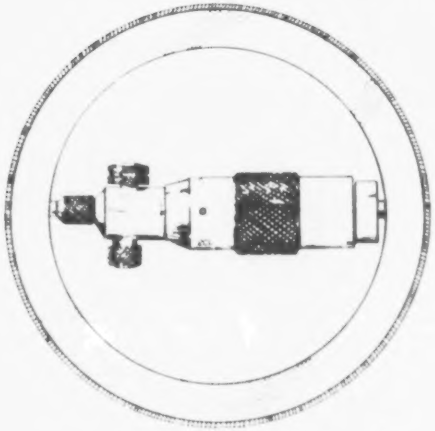


Base Unit

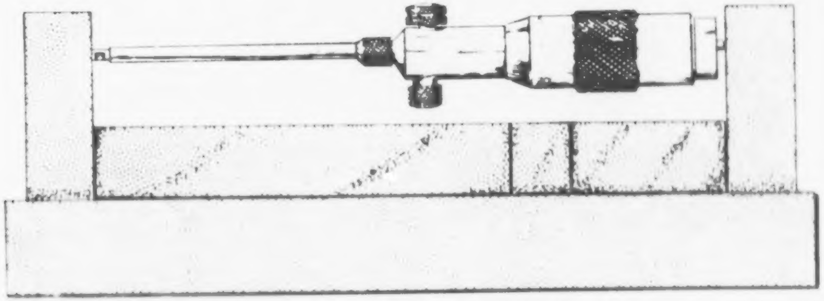


Extension Handle

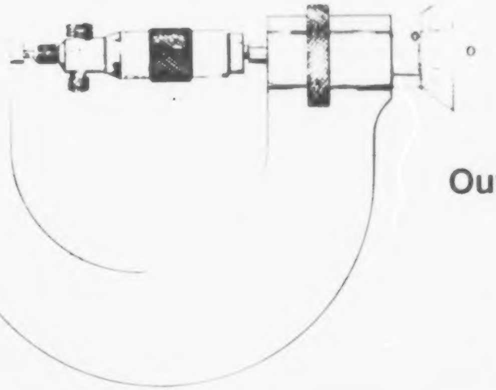
Methods for Checking Accuracy of an Inside Micrometer



Ring Gauge Method

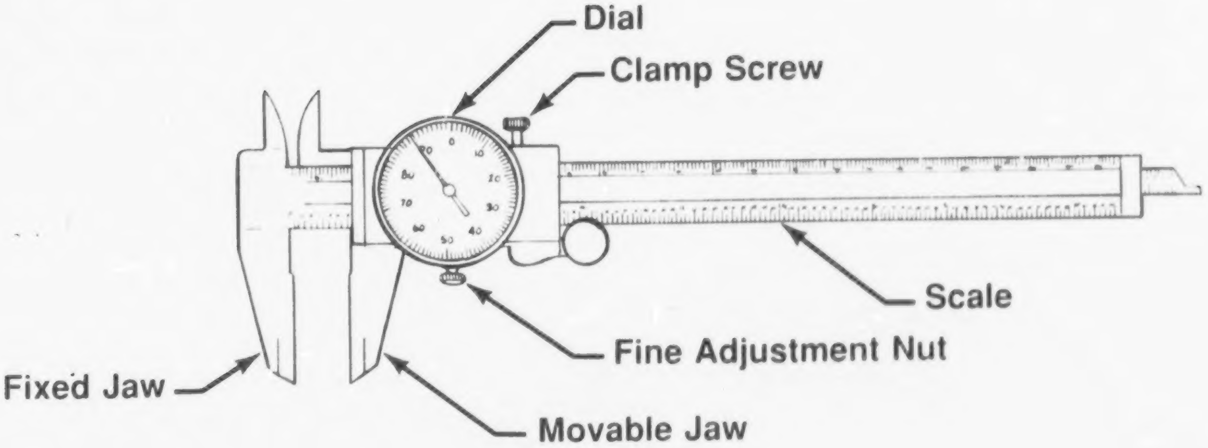


Gauge and Block Method



Outside Micrometer Method

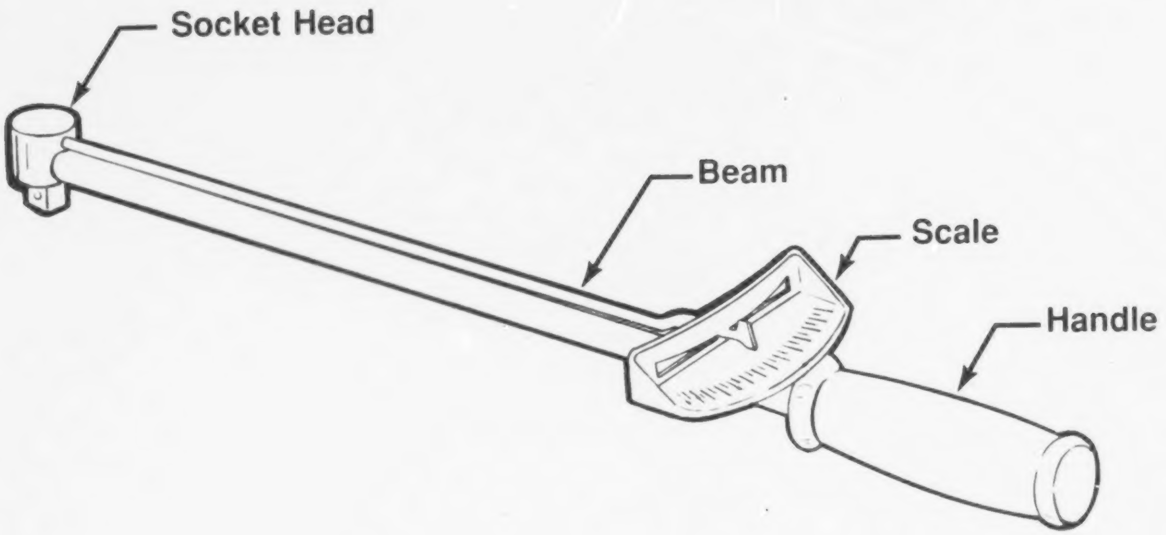
Parts of a Dial Caliper


Dial
Clamp Screw
Scale
Fine Adjustment Nut
Fixed Jaw
Movable Jaw

Parts Specialist, Unit 9
Teacher Page 49

TM 14

Parts of a Torque Wrench

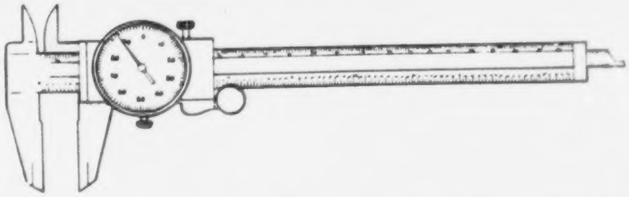

Socket Head
Beam
Scale
Handle

Measuring
Unit 9

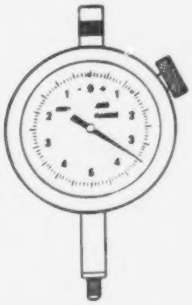
Information Sheet

1. **Terms and definitions**

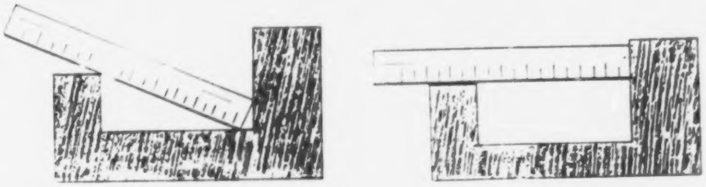
   a. **Dial caliper** — Instrument used to make high-precision measurements; can take both inside and outside measurements of parts and components



   b. **Dial indicator** — Precision instrument designed to measure small amounts of movement; may be graduated in thousandths of an inch or hundredths of a millimeter



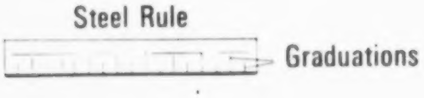
   c. **Error** — Mistake in the reading or total measurement



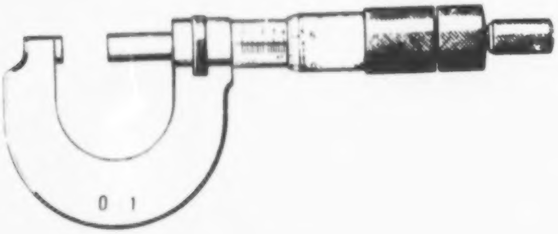
   d. **Feel** — A sense of touch developed to such a degree that two people can measure a workpiece and arrive at measurements that are exactly the same

Information Sheet

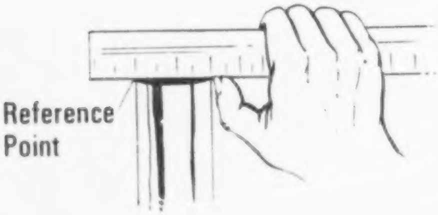
e. **Graduation** — Marking found on rules and scales to denote unit of length, diameter, or torque


Steel Rule
Graduations

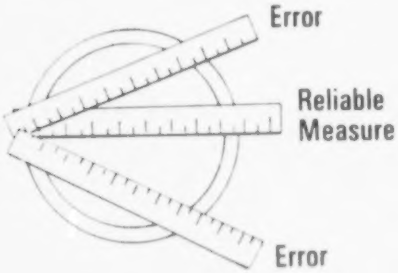
f. **Micrometer** — Instrument used to measure accurately to 0.001 inch or 0.01 millimeter



g. **Reference point** — Starting point of measurement for both workpiece and rule


Reference Point

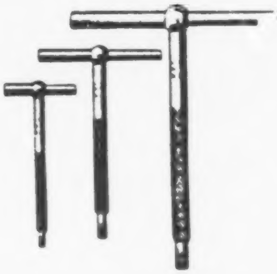
h. **Reliable measure** — Accurate or true measure


Error
Reliable Measure
Error

Information Sheet

i. **Steel rule** — Semi-precision instrument graduated in fractional or decimal parts of an inch or metric measure

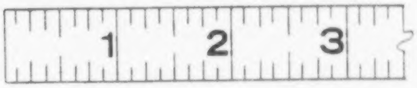
j. **Telescoping gauge** — Instrument used to measure the internal diameter of parts; range in size from 5⁄16 inch to 6 inches



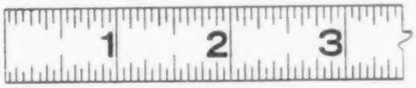
2. **Basic units of measurement found on rules**

a. **Fractional**

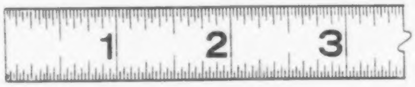
- Eighths (1/8″)



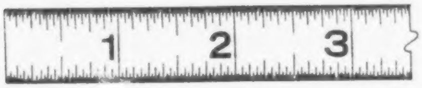
- Sixteenths (1/16″)



- Thirty-seconds (1/32″)

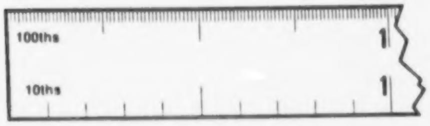


- Sixty-fourths (1/64″)



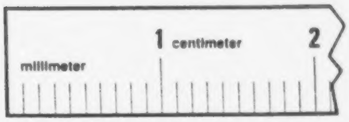
b. **Decimal**

- Tenths (0.1)
- Hundredths (0.01)


100ths
1
10ths
1

c. **Metric**

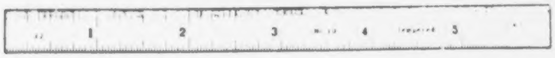
- Meter (1.0m)
- Decimeter (0.1m)
- Centimeter (0.01m)
- Millimeter (0.001m)


1 centimeter
2
millimeter

3. Types of rules used by a parts specialist

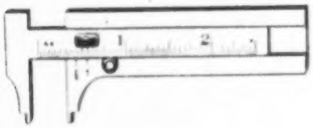
a. Steel rule

b. Narrow flexible rule

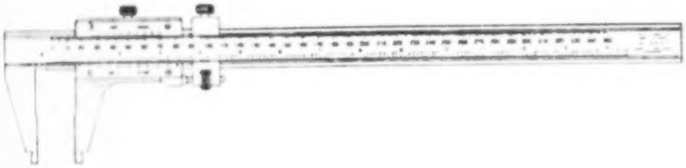


Information Sheet

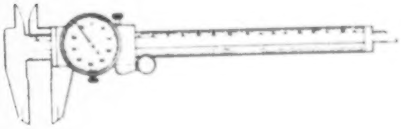
c. Slide caliper rule



d. Vernier caliper rule



e. Dial indicator caliper rule



4. Guidelines for using rules

a. Use the proper length and graduation.

b. Use finest graduation for accuracy.

Note: The use of "half an eighth," or "about two-thirds of a thirty-second" will not provide accurate measurements. Always use a rule with sufficiently fine graduations to obtain an accurate measurement.

c. Use a good quality rule.

d. Do not bend or distort a steel rule.

Information Sheet

e. Use rule only for intended (measuring) purpose.

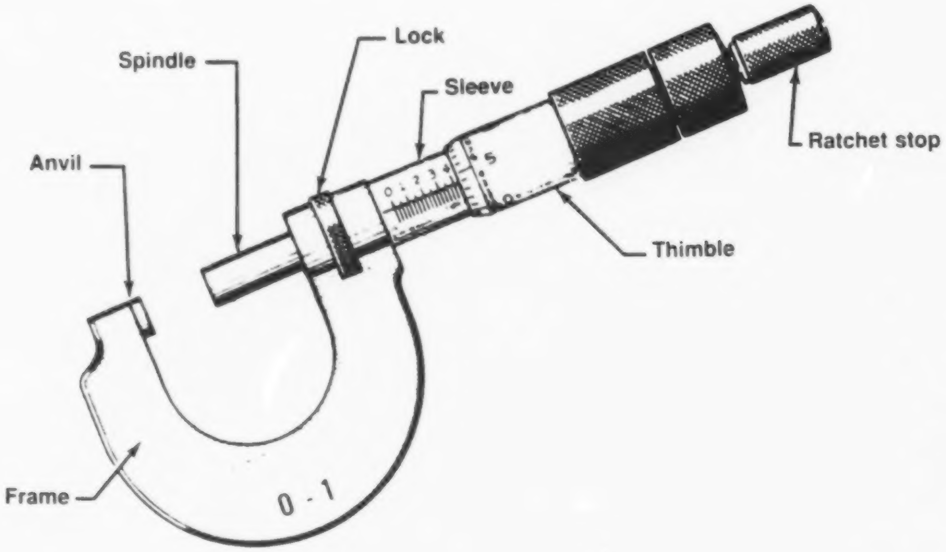
Note: A steel rule used to scrape gasket material off from customer parts, scrape away grease to find serial numbers, to open a blister pack of auto parts, or any other purpose than measuring, will ultimately become bent, marred, and inaccurate.

f. Use whole unit graduation as reference for accuracy.

g. Use rule on edge for better reading.

h. Use rule along axis parallel to plane of measurement.

5. Parts of an outside micrometer


Lock
Spindle
Sleeve
Anvil
Ratchet stop
Thimble
Frame
0 - 1
0 1 2 3 4
5
0

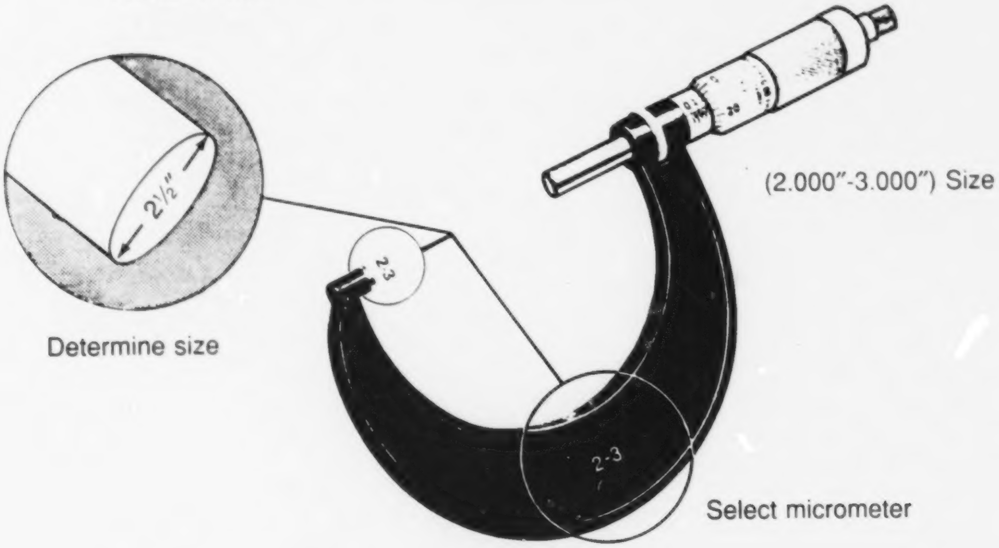
Information Sheet

6. Selecting the proper size outside micrometer

a. Determine the approximate size of the workpiece.

b. Observe the capacity of the outside micrometer on the frame.

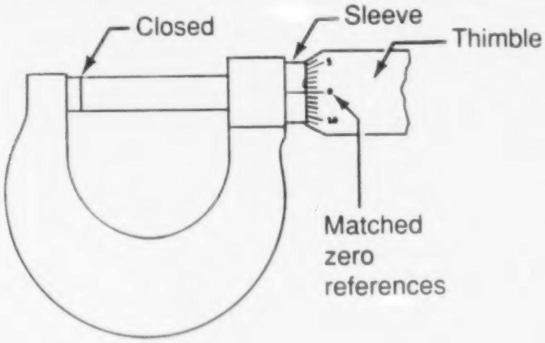
Note: On variable range micrometers, the capacity of the micrometer is located on each anvil.


2½"
2-3
(2.000"-3.000") Size
Determine size
2-3
Select micrometer

7. Methods for checking accuracy of an outside micrometer

a. 0" - 1.000"

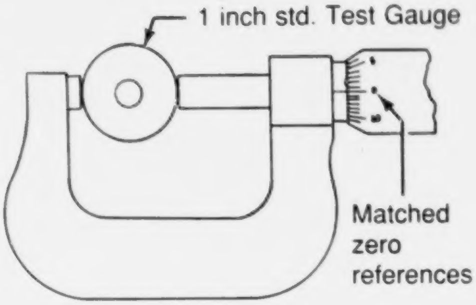
- Close spindle and anvil together.
- Observe zero references on the sleeve and thimble.


Closed
Sleeve
Thimble
Matched zero references

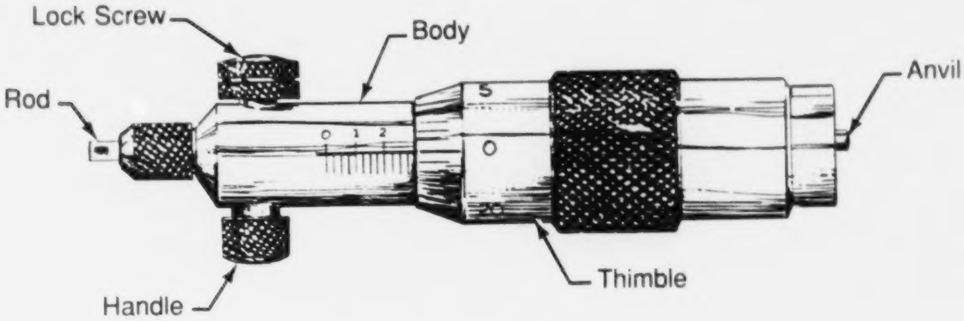
Information Sheet

b. More than one inch

- Use a standard bar or disc to check the minimum capacity.
- Observe zero references on the sleeve and thimble.


1 inch std. Test Gauge
Matched zero references

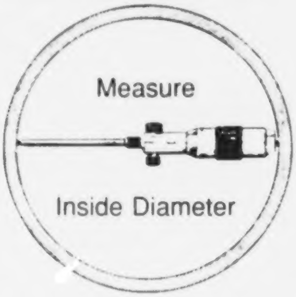
8. Parts of an inside micrometer


Lock Screw
Body
Anvil
Rod
Handle
Thimble

9. Uses of an inside micrometer

a. Measure inside diameter.

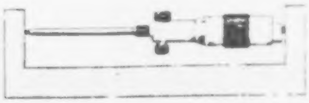
Examples: Drilled holes, bored holes (cylinder bores, etc.), reamed holes (valve stem guides, etc.)


Measure
Inside Diameter

Information Sheet

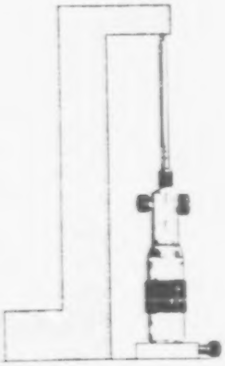
b. Measure width.

Examples: Slots, grooves, etc.

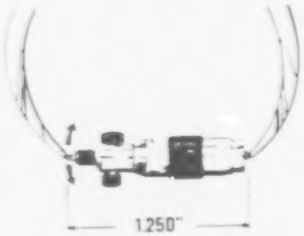


c. Measure height.

Note: A base attachement should be used.



d. Transfer measurement to outside spring-joint caliper.



Information Sheet

10. Accessories used with an inside micrometer

a. Extension rod

Note: The rod extends the measuring capacity of the base unit.

b. Extension collar

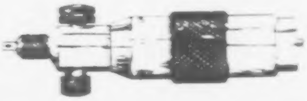
Note: The extension collar locks the extension rod to the base unit and extends the measuring capacity by 0.500".

c. Extension handle

Note: Hard-to-reach places can be measured more easily when an extension handle is used.

d. Base unit

Note: Base units come in various ranges of measurement.



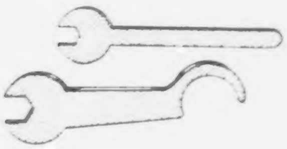
e. Height gauge base

Note: The base enables the micrometer to be used for inspection or setup work.

Information Sheet

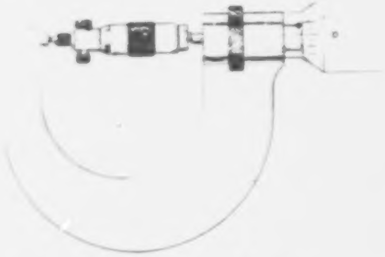
f. Wrench

Note: The wrench is used to adjust micrometer accuracy.



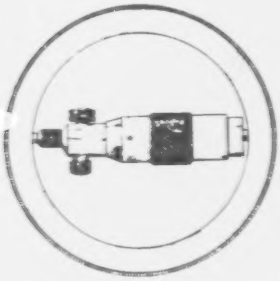
11. Methods for checking accuracy of an inside micrometer

a. Measure the zero reference of an inside micrometer with an accurate outside micrometer.



Outside Micrometer Method

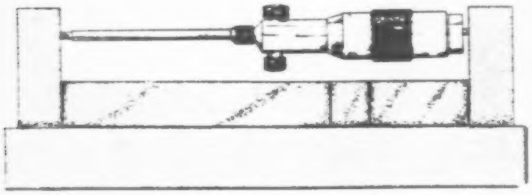
b. Measure an object of known accurate measurement or use a standard ring gauge.



Ring Gauge Method

Information Sheet

c. Use a gauge block holder and gauge blocks to check an extension bar measurement.



Gauge and Block Method

12. Rules for use and care of micrometers

a. Keep instruments away from heat, abrasive dust, moisture, oil, and grease.

b. If the micrometer needs cleaning, wipe it with light machine oil and a soft, lit-free cloth. This will also help prevent corrosion.

c. Check the instrument for accuracy before use.

Note: Observe for worn or loose parts. If the micrometer is dropped, do not use it again until it has been checked for accuracy against a standard. It may need to be adjusted.

d. Do not overtighten the instrument during measurement.

e. Keep the micrometer in its case or box when it is not being used, and **do not** store it with other tools.

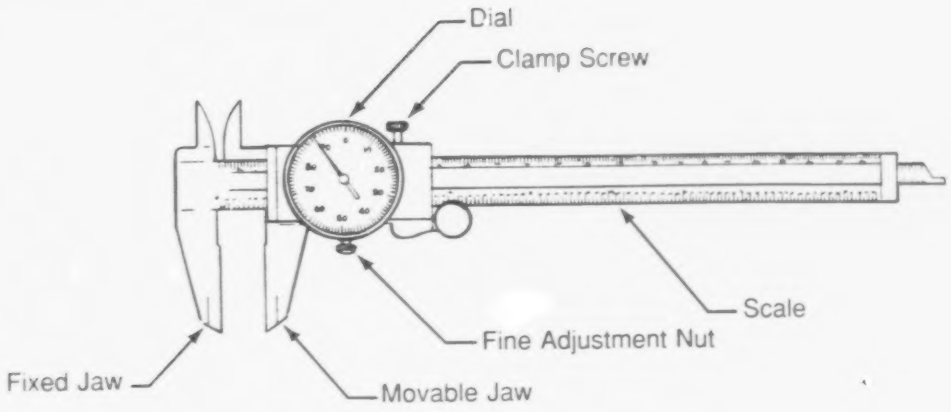
f. Handle the instrument in the correct manner.

g. Use instrument only for intended purpose.

Note: A micrometer is a measuring tool, not a "C" clamp.

Information Sheet

13. Parts of a dial caliper


Dial
Clamp Screw
Scale
Fine Adjustment Nut
Fixed Jaw
Movable Jaw

14. Guidelines for care of dial calipers

a. Keep the dial caliper free of dust, grit, and grease.

b. Gently clean the dial caliper with light machine oil and a soft, lint-free cloth.

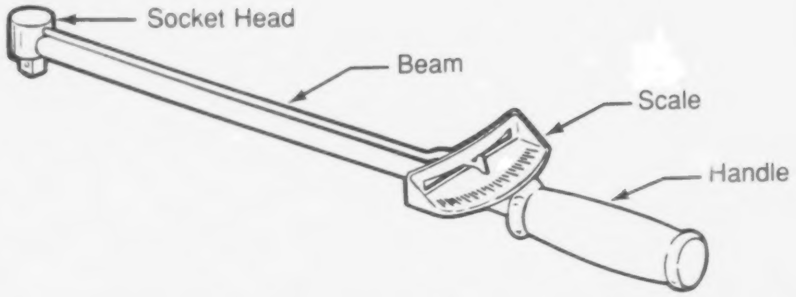
Note: This will help prevent corrosion.

c. Keep the dial caliper in its case when it is not being used, and **do not** store it with other tools.

d. When storing, leave a gap between the fixed and movable jaws to allow for the expansion and contraction of the metal in the caliper.

Information Sheet

15. Parts of a torque wrench



Note: Torque wrenches are usually calibrated in foot or inch pounds, depending upon their design, and many have a dual scale including the metric torque measurement of newton-meters. Also, the "beam" type torque wrench is rapidly being replaced by so-called preset wrenches, which are set to a specific torque and emit an audible "click" when that torque reading has been met. Other torque wrenches use digital (electric liquid crystal display) to provide readings of rotating force.

16. Types of feeler gauges

a. Blade

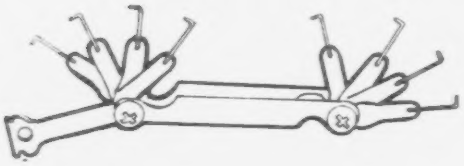
- Flat blades in a variety of labeled thicknesses

  Note: Flat blades are sometimes bent at an angle to allow easier use in confined spaces. Also, when a thickness is called for that is between the prelabeled blades of a feeler gauge set, blades of known thicknesses may be "stacked" on one another to achieve the proper thickness for measurement.

- Stepped or go, no-go blades used to measure a predetermined maximum clearance

  Example: When a 0.006 valve lash clearance is called for when an engine is at operating temperature, but a clearance of more than 0.010 is excessive. A 0.006 - 0.010 stepped gauge would be used. 0.006″ would "go", but 0.010″ would not fit, therefore it would be a "no go" fit.

b. Wire



Measuring
Unit 9

Assignment Sheet 1—Read U.S. Customary and Metric Rules

Name ______________________ Overall Rating ____________

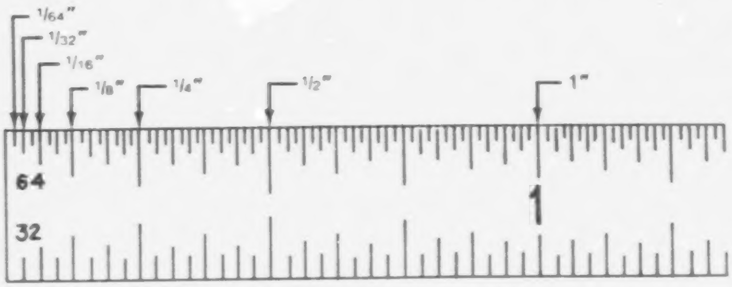
Evaluation criteria	Rating
Directions have been followed	______
85% of the questions have been answered correctly	______

Introduction: American industry is changing from the U.S. customary system to the metric system. For this reason, you will find U.S. customary/metric steel rules with an inch scale on one edge (graduated in sixteenths, thirty-seconds, or sixty-fourths) and a centimeter scale on the other side (graduated in millimeters). You must work with decimals and fractions to make accurate measurements with metric and inch rules.

Reading fractional measurements on a U.S. customary rule

Note: All rules are read similarly. However, some rules are graduated with more divisions than others. The enlarged rule illustrated in Figure 1 below is graduated in sixty-fourths of an inch on the top scale and thirty-seconds of an inch on the bottom scale. The staggered graduations are for halves, quarters, eighths, sixteenths, thirty-seconds, etc.

Figure 1

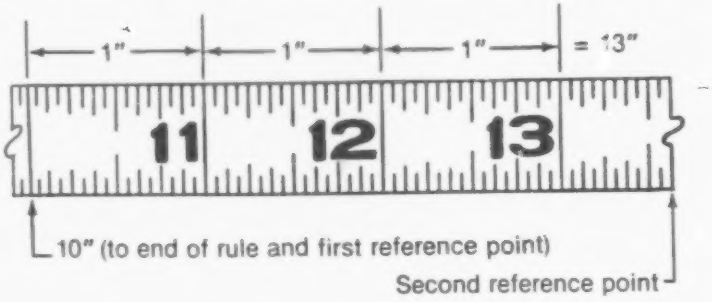


Assignment Sheet 1

1. Align the end of the rule with one reference point.

2. Determine the number of whole units between the end of the rule and the second reference point (see Figure 2).

Figure 2



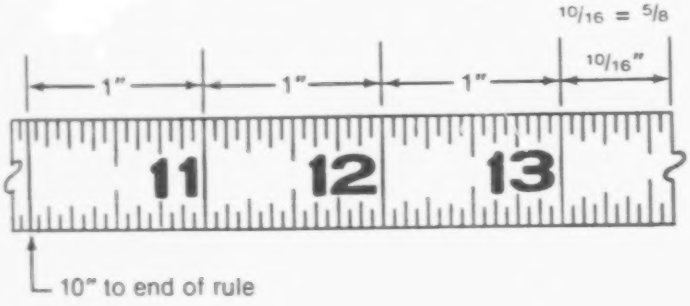
10" (to end of rule and first reference point)

Second reference point

3. Determine the number of fractional units between the last whole unit and the second reference point by counting the divisions.

4. Place this number over the rule scale (the rule in Figure 3 below is scaled in sixteenths of an inch) and reduce this fraction if possible.

Figure 3



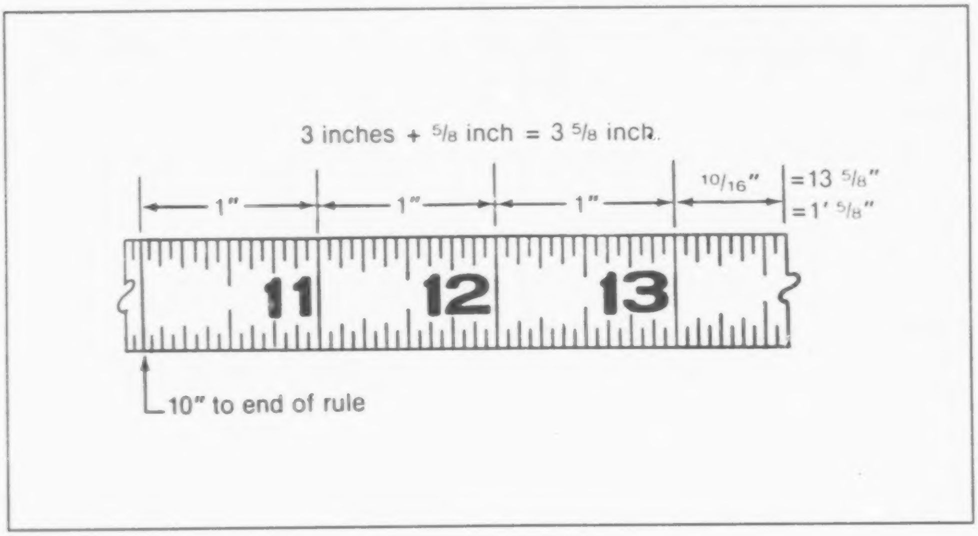
10" to end of rule

Assignment Sheet 1

5. Make a mixed fraction by adding this reduced fraction to the number of whole units counted earlier; convert inches to feet if necessary by dividing 12 into the total whole inches measured (see Figure 4).

Example: 3 inches + 5/8 inch = 3 5/8 inches

Figure 4

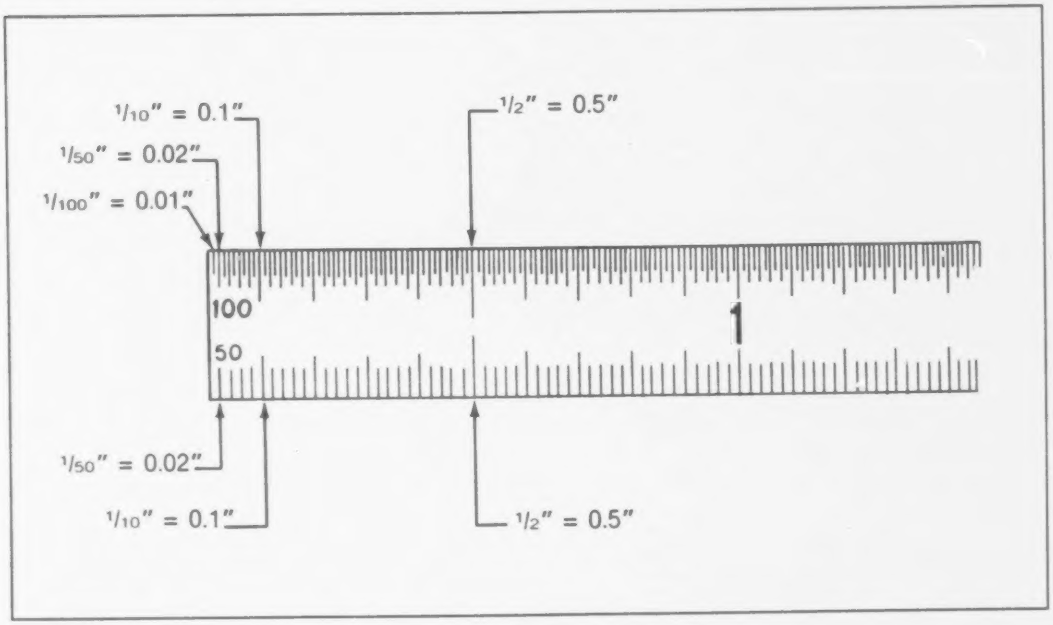


Reading decimal-inch measurements on a U.S. customary rule

Note: U.S. customary rules with decimal-inch increments allow for more precise measurements. The top scale on the enlarged rule illustrated in Figure 5 on the next page is graduated in one-hundredths of an inch (0.01 inch). The bottom scale is graduated in fiftieths of an inch (0.02 inch). The staggered graduations are for halves, tenths, and fiftieths.

Assignment Sheet 1

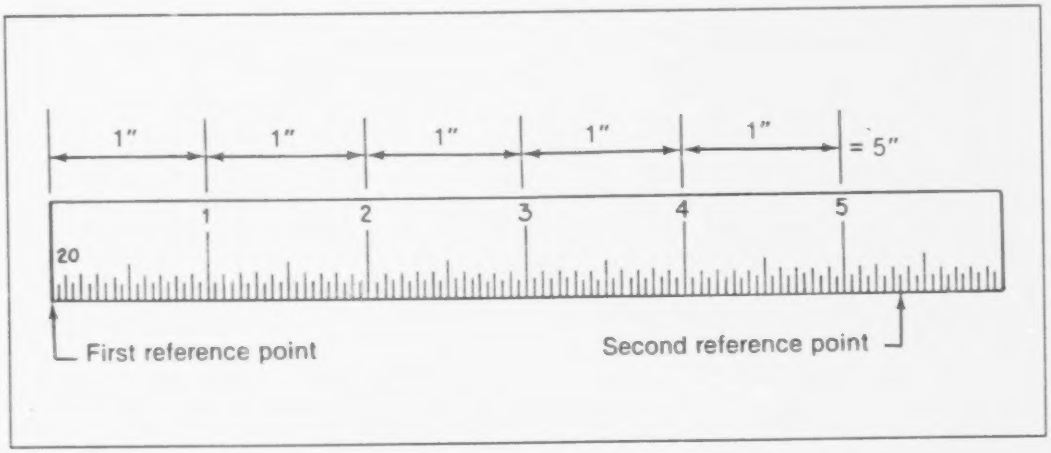
Figure 5


1/10" = 0.1"
1/50" = 0.02"
1/100" = 0.01"
1/2" = 0.5"
100
50
1
1/50" = 0.02"
1/10" = 0.1"
1/2" = 0.5"

1. Align the end of the rule with one reference point.
2. Determine the number of whole units between the end of the rule and the second reference point.

Note: The rule illustrated in Figure 6 below is graduated in twentieths of an inch.

Figure 6

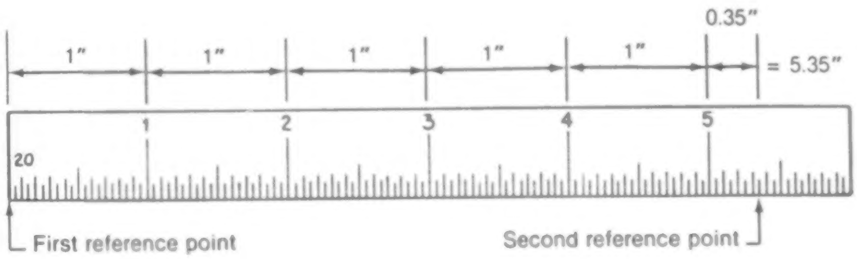

1"
1"
1"
1"
1"
= 5"
1
2
3
4
5
20
First reference point
Second reference point

Assignment Sheet 1

3. Count the number of graduations (twentieths. 0.05 inch) between the last whole unit and the second reference point.

4. Add this decimal fraction to the number of whole units counted earlier (see Figure 7).

Figure 7



Reading a metric rule

Note: Metric steel rules are available in a range from 150 milli-meters to 1000 millimeters (1 meter) in length. The smallest graduation is 0.5 millimeter.

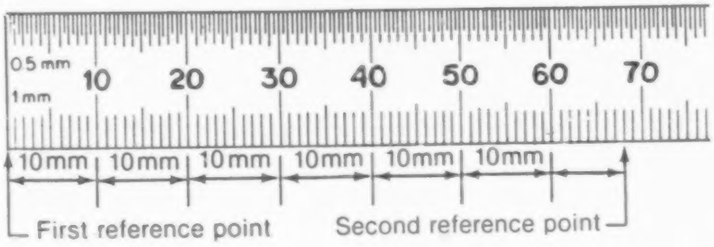
1. Align the end of the rule with one reference point.

2. Determine the number of whole units between the end of rule and the second reference point.

   Note: The enlarged metric rule illustrated in Figure 8 on the next page is graduated in half millimeters (0.5) on the top and whole millimeters (1 mm) on the bottom scale.

Assignment Sheet 1

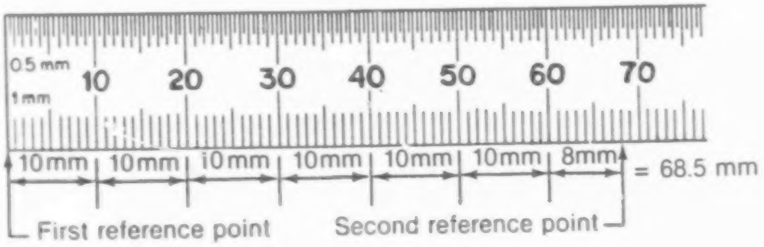
Figure 8


0.5 mm
1 mm
10
20
30
40
50
60
70
10mm
10mm
10mm
10mm
10mm
10mm
First reference point
Second reference point

3. Count the number of graduations (single and half millimeters) between the last whole unit and the second reference point.

4. Add this number to the number of whole units counted earlier (see Figure 9).

Figure 9

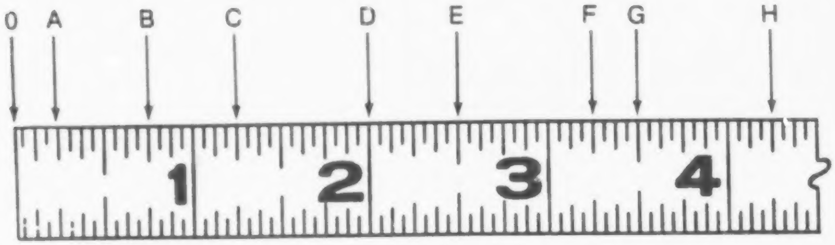

0.5 mm
1 mm
10
20
30
40
50
60
70
10mm
10mm
10mm
10mm
10mm
10mm
8mm
= 68.5 mm
First reference point
Second reference point

Assignment Sheet 1

Directions: This assignment sheet is divided into three parts. Read each part, and then, answer the questions in each part.

Part A

1. Read the U.S. customary rule illustrated below to the nearest quarter inch. Write your answers on the blanks provided.



a. 0 to A = ______

b. A to B = ______

c. 0 to C = ______

d. A to D = ______

e. B to D = ______

f. 0 to E = ______

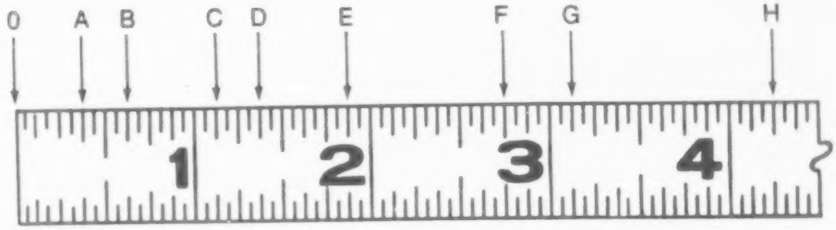
g. C to E = ______

h. B to F = ______

i. D to G = ______

j. A to H = ______

2. Read the U.S. customary rule illustrated below to the nearest eighth inch. Write your answers on the blanks provided.



a. 0 to A = ______

b. A to B = ______

c. 0 to C = ______

d. B to D = ______

e. A to E = ______

f. 0 to F = ______

g. D to E = ______

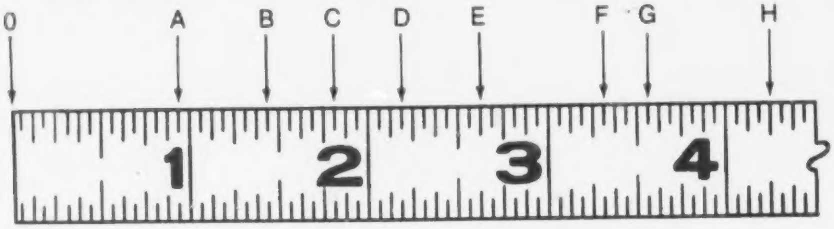
h. C to G = ______

i. 0 to H = ______

j. E to H = ______

Assignment Sheet 1

3. Read the U.S. customary rule illustrated below to the nearest sixteenth inch. Write your answers on the blanks provided.



a. 0 to A = ____________

b. A to B = ____________

c. 0 to C = ____________

d. B to D = ____________

e. A to E = ____________

f. 0 to F = ____________

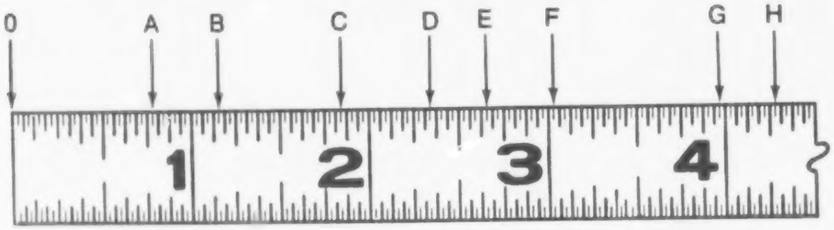
g. C to F = ____________

h. A to G = ____________

i. 0 to H = ____________

j. E to H = ____________

4. Read the U.S. customary rule illustrated below to the nearest one thirty-second of an inch. Write your answers on the blanks provided.



a. 0 to A = ____________

b. 0 to B = ____________

c. A to B = ____________

d. 0 to C = ____________

e. A to D = ____________

f. B to E = ____________

g. C to F = ____________

h. B to G = ____________

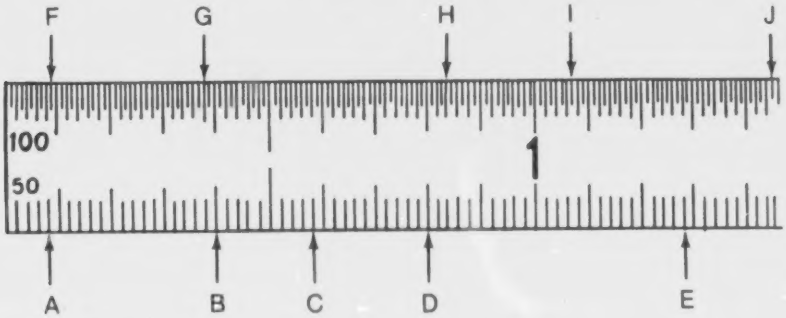
i. 0 to H = ____________

j. D to H = ____________

Assignment Sheet 1

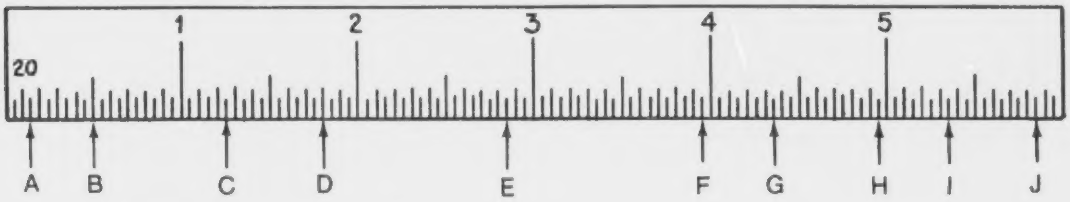
Part B

1. Read the U.S. customary rule with decimal graduations in fiftieths and hundredths shown below. Write your answers on the blanks provided.



a. 0 to A = __________
b. 0 to B = __________
c. 0 to C = __________
d. 0 to D = __________
e. 0 to E = __________
f. 0 to F = __________
g. 0 to G = __________
h. 0 to H = __________
i. 0 to I = __________
j. 0 to J = __________

2. Read the U.S. customary rule with decimal graduations in twentieths shown below. Write your answers on the blanks provided.

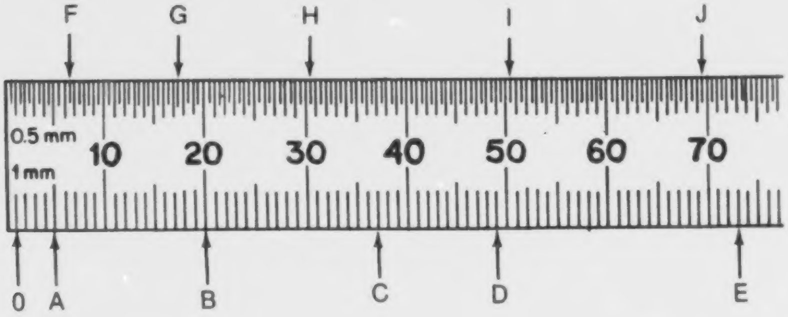


a. 0 to A = __________
b. 0 to B = __________
c. 0 to C = __________
d. 0 to D = __________
e. 0 to E = __________
f. 0 to F = __________
g. 0 to G = __________
h. 0 to H = __________
i. 0 to I = __________
j. 0 to J = __________

Assignment Sheet 1

Part C

Read the enlarged metric rule with 1-millimeter and 0.5-millimeter graduations shown below. Write your answers on the blanks provided.


F
G
H
I
J
0.5 mm
10
20
30
40
50
60
70
1 mm
0
A
B
C
D
E

1. 0 to A = ____________

2. 0 to B = ____________

3. 0 to C = ____________

4. 0 to D = ____________

5. 0 to E = ____________

6. 0 to F = ____________

7. 0 to G = ____________

8. 0 to H = ____________

9. 0 to I = ____________

10. 0 to J = ____________

Measuring
Unit 9

Assignment Sheet 2—Draw Lines to Specified Lengths

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	_____
Skills have been correctly demonstrated	_____
Student applied serious effort while completing assignment	_____

Introduction: The use of a steel rule to determine accurate measurements is an important part of success as a parts specialist. This exercise will help you sharpen this skill.

Directions: With a steel rule and a pen or pencil, draw straight lines of the following lengths:

1. 2 1/4 inches
2. 3 3/4 inches
3. 4 1/2 inches
4. 1 1/8 inches
5. 2 5/8 inches
6. 4 3/8 inches
7. 5 7/8 inches
8. 2 1/16 inches
9. 4 5/16 inches
10. 5 9/16 inches
11. 3 15/16 inches
12. 5 7/32 inches
13. 1 19/32 inches
14. 2 1/64 inches

Assignment Sheet 2

15. 1 9/64 inches
16. 3 3/64 inches
17. 4 47/64 inches
18. 4 31/32 inches

Measuring
Unit 9

Assignment Sheet 3—Measure Lines Using a Steel Rule

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Skills have been correctly demonstrated	______
Student applied serious effort while completing assignment	______

Introduction: The use of a steel rule to determine accurate measurements is an important part of success as a parts specialist. This exercise will help you sharpen this skill.

Directions: Using a correctly graduated scale or rule, measure the following lines to the specified graduations. Reduce measures to the lowest terms (i.e., 16/64″ = 1/4″) and write correct answers on the lines.

1. Measure these lines to the nearest quarter of an inch.

   a.

   b.

   c.

   d.

2. Measure these lines to the nearest eighth of an inch.

   a.

   b.

   c.

   d.

3. Measure these lines to the nearest sixteenth of an inch.

   a.

   b.

Assignment Sheet 3

c. ________________________

d. ______________________________

4. Measure these lines to the nearest thirty-second of an inch.

a. ____

b. ________________________________

c. __________________

d. _____________________________________

5. Measure these lines to the nearest sixty-fourth of an inch.

a. _________________________

b. ________________________________

c. ______________________________________

d. ______________

6. Measure these lines to the nearest centimeter.

a. __________

b. ______________________

c. ___

d. ____

7. Measure these lines to the nearest millimeter.

a. ________

b. ___________________

c. ____________________________________

d. ____

Measuring
Unit 9

Assignment Sheet 4—Measure Lines on Objects

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
Directions have been followed	_____
Skills have been correctly demonstrated	_____
Student applied serious effort while completing assignment	_____

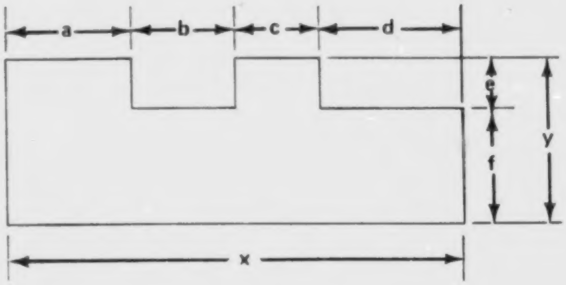
Introduction: The use of a steel rule to determine accurate measurements is an important part of success as a parts specialist. This exercise will help you sharpen this skill.

Directions: Use a steel rule to measure each lettered dimension on the objects below. Use the finest graduation (64ths) on the rule and reduce measure to lowest terms (i.e., 16/64" = 1/4"). Indicate each individual measurement (in lowest terms) in the correct answer space.

ANSWER

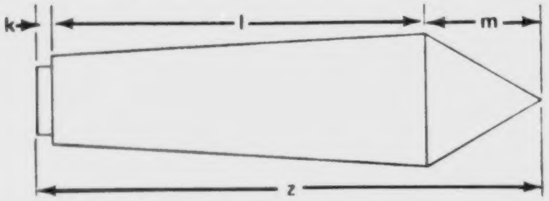
1. a. ____________
b. ____________
c. ____________
d. ____________
e. ____________
f. ____________
x. ____________
y. ____________

1.



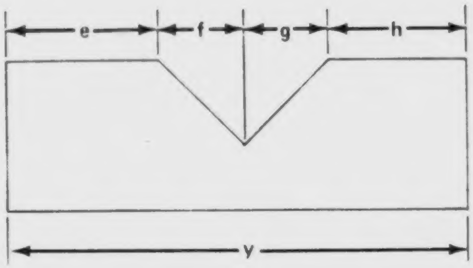
2. k. ____________
l. ____________
m. ____________
z. ____________

2.



3. e. ____________
f. ____________
g. ____________
h. ____________
y. ____________

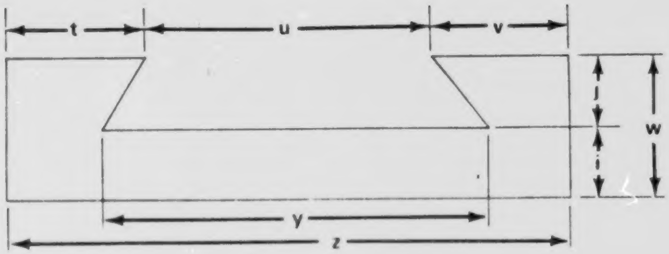
3.



Assignment Sheet 4

4. t. ______________
   u. ______________
   v. ______________
   y. ______________
   z. ______________
   j. ______________
   i. ______________
   w. ______________

4.



Measuring
Unit 9

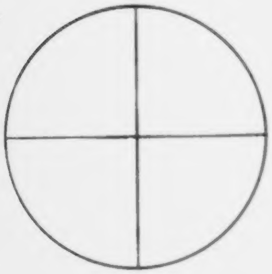
Assignment Sheet 5—Measure the Diameter of a Circle

Name ______________________________ Overall Rating ____________

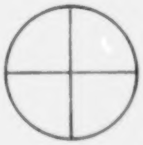
Evaluation criteria	**Rating**
Directions have been followed	____
Skills have been correctly demonstrated	____
Student applied serious effort while completing assignment	____

Introduction: The use of a steel rule to determine accurate measurements is an important part of success as a parts specialist. This exercise will help you sharpen this skill.

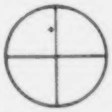
Directions: Use the rule to measure each given circle. Use the finest graduation on the rule (64ths) and reduce the dimension to lowest terms (i.e., 16/64″ = 1/4″). Make certain that the true diameter of the circle is measured by measuring along the axis line. Indicate the correct dimension in the space provided.



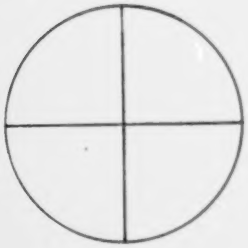
1. ____________



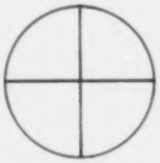
2. ____________



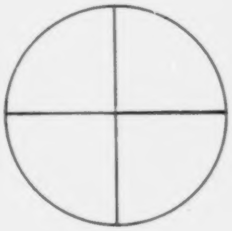
3. ____________



4. ____________

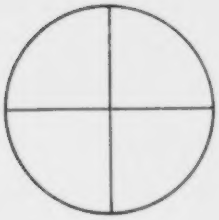


5. ____________

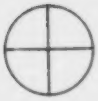


6. ____________

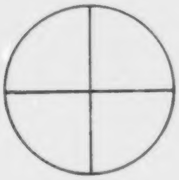
Assignment Sheet 5



7. ____________



8. ____________



9. ____________

Measuring
Unit 9

Assignment Sheet 6—Read Standard and Metric Micrometers

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
85% of the questions have been answered correctly	______

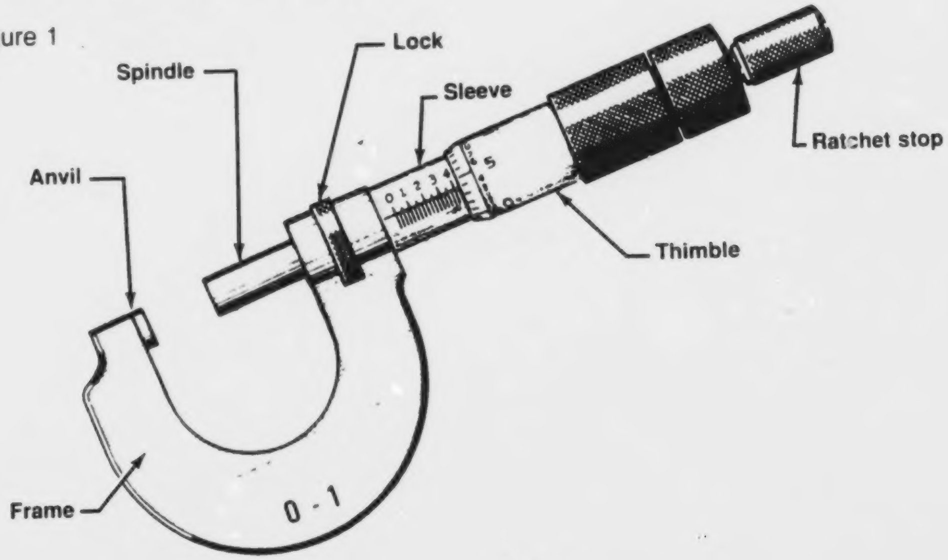
Introduction: Micrometers are measuring tools commonly used by service specialists. Micrometers are used to measure accurately to 0.001 inch or 0.01 millimeter. The three basic types of micrometers are outside, inside, and depth micrometers. In this assignment sheet, you will learn to read standard and metric inside and outside micrometers.

Reading outside micrometers

Outside micrometers come in a variety of sizes. Each one is used to measure only a particular range, so you must be sure to choose the proper size. Micrometer sizes 0 to 1 inch, 1 to 2 inches, 2 to 3 inches, and 4 to 5 inches are commonly used. Regardless of the construction or size, the micrometer principle remains the same: The total measurement is equal to the sum of the reading on the barrel and sleeve.

If you have a standard micrometer available, refer to it while you read the following information, which explains how to read a micrometer. Figure 1 below shows the various parts of the typical outside micrometer.

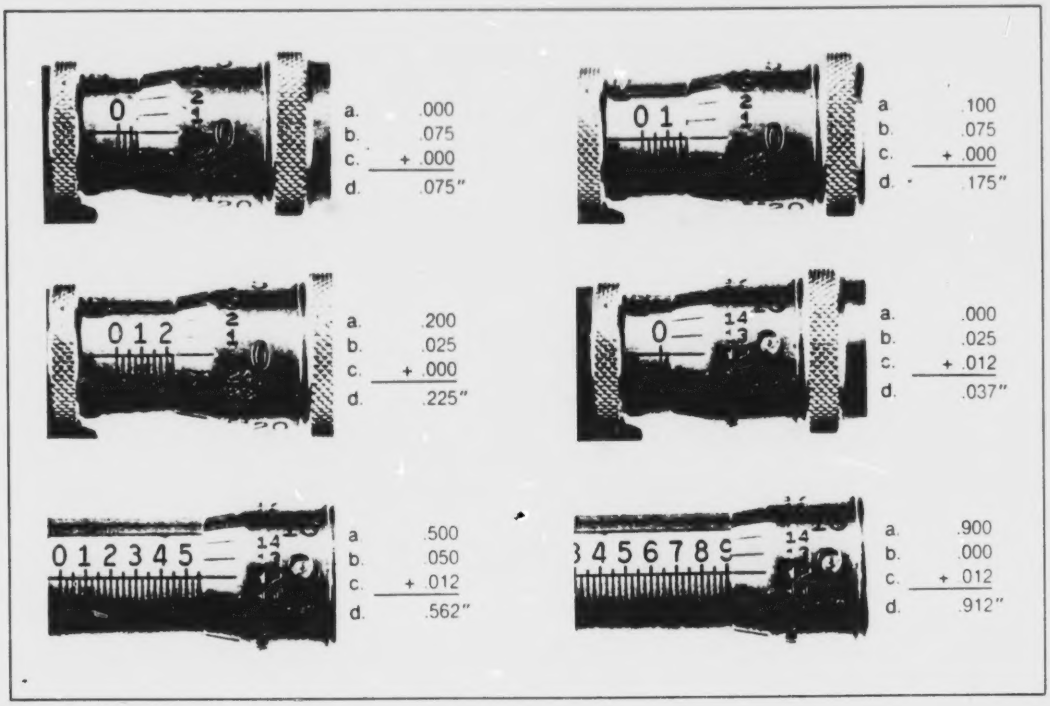
Figure 1



Assignment Sheet 6

1. Note the number of the last vertical line visible on the sleeve (each numbered line on the sleeve represents a .100-inch increment).
2. Add .025 inch for each additional line that shows on the sleeve.
3. Add to this figure the number of the graduation on the thimble (there are 25 lines on the thimble, each equal to 0.001 inch).
4. Read the required reading as the sum of all additions; see the examples in Figure 2.

Figure 2



a. .000
b. .075
c. + .000
d. .075"

a. .100
b. .075
c. + .000
d. .175"

a. .200
b. .025
c. + .000
d. .225"

a. .000
b. .025
c. + .012
d. .037"

a. .500
b. .050
c. + .012
d. .562"

a. .900
b. .000
c. + .012
d. .912"

Reading metric micrometers

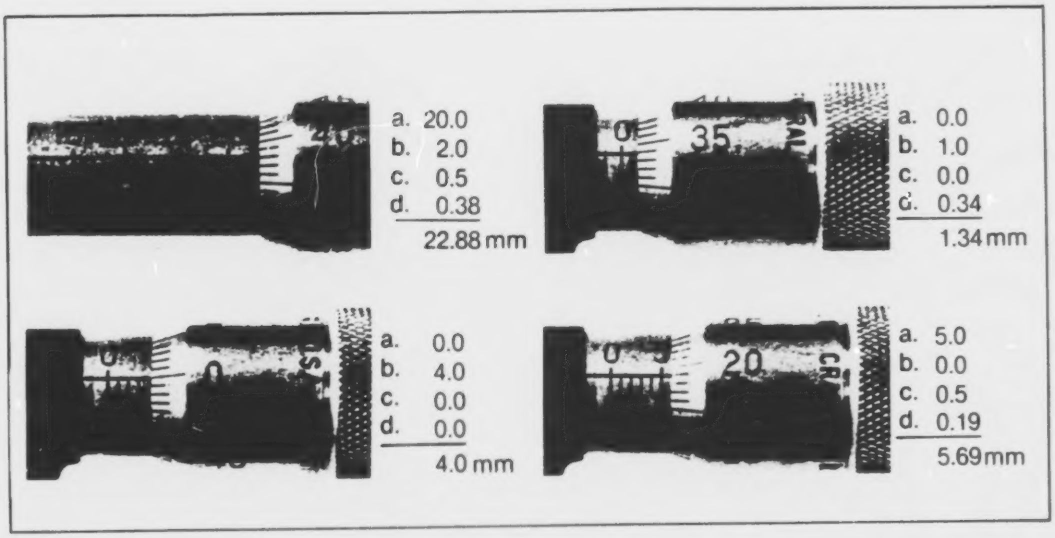
Metric-micrometer sizes 0 to 25 millimeters, 25 to 50 millimeters, and 50 to 75 millimeters are commonly used. Metric micrometers are read in the same manner as standard micrometers. The metric micrometer is graduated to read to an accuracy of 0.01 millimeter (equivalent to 0.0004 inch).

Assignment Sheet 6

If you have a metric micrometer available, refer to it while you read the following information, which explains how to read a metric micrometer.

1. Note the number on the last vertical line visible on the sleeve (each numbered line on the sleeve represents a 5-millimeter increment).
2. Add 1 millimeter for each additional line that shows on top of the sleeve above the index line.
3. Add 0.5 millimeter for each additional line that shows on the bottom of the sleeve below the index line.
4. Add the number of graduations on the thimble (there are 50 lines on the thimble, each equal to 0.01 millimeter).
5. Read the required reading as the sum of all additions; see the examples in Figure 3.

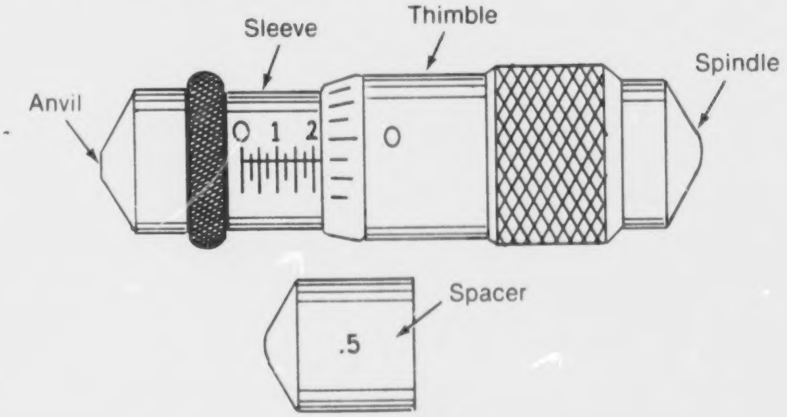
Figure 3


a. 20.0
b. 2.0
c. 0.5
d. 0.38
22.88 mm
a. 0.0
b. 1.0
c. 0.0
d. 0.34
1.34 mm
a. 0.0
b. 4.0
c. 0.0
d. 0.0
4.0 mm
a. 5.0
b. 0.0
c. 0.5
d. 0.19
5.69 mm
35
20
0
5

Assignment Sheet 6

Reading inside micrometers (metric and customary)

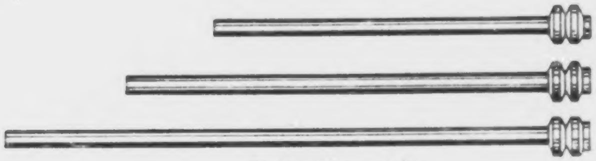
Figure 4


Sleeve
Thimble
Spindle
Anvil
0 1 2
0
Spacer
.5

Inside micrometer

The inside micrometer is read in exactly the same way as the outside micrometer. However, most inside micrometers have only .500 travel; a spacer of .500 is used to cover the remainder of the inch. Anything over 1 inch requires the use of extension rods; see Figure 5.

Figure 5



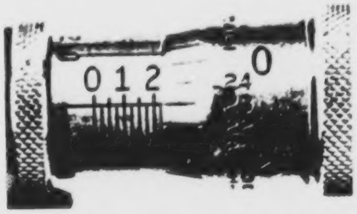
Extension rods

Assignment Sheet 6

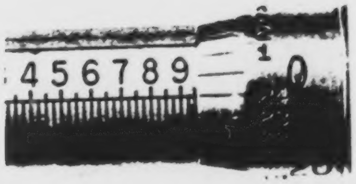
Part A

Directions: Read the settings on the following U.S. customary micrometers graduated in 0.001 inch. Write your answers on the blanks.

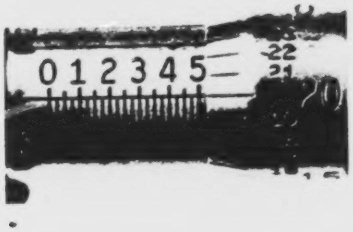
______ 1.



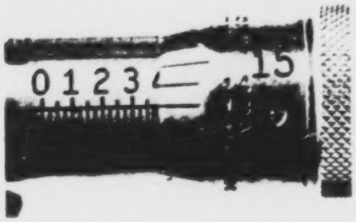
______ 2.



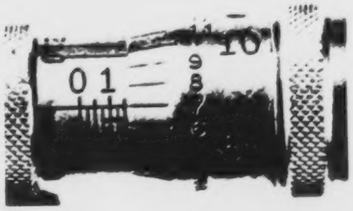
______ 3.


0 1 2 3 4 5
22
21
20

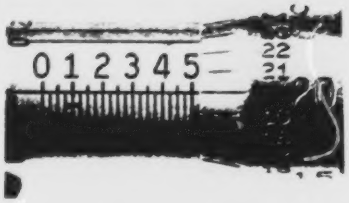
______ 4.



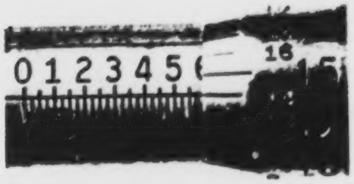
______ 5.



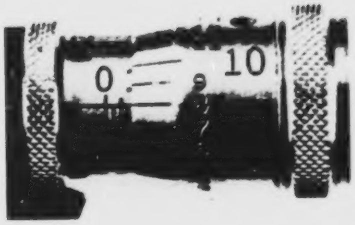
______ 6.


0 1 2 3 4 5
22
21

______ 7.

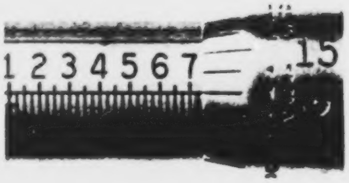

0 1 2 3 4 5
16
15

______ 8.

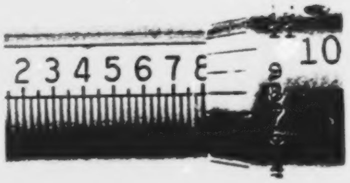


Assignment Sheet 6

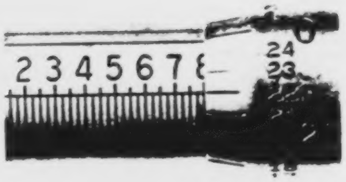
______ 9.



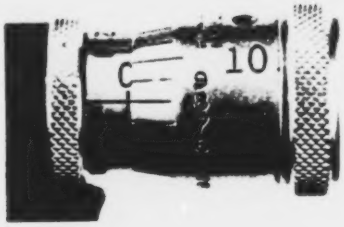
______ 10.


2 3 4 5 6 7 8
10
9

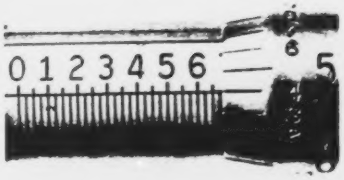
______ 11.


2 3 4 5 6 7 8
0
24
23

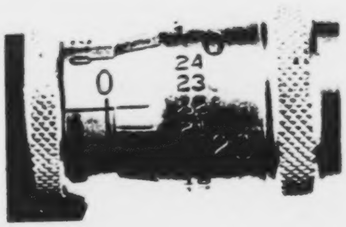
______ 12.



______ 13.



______ 14.

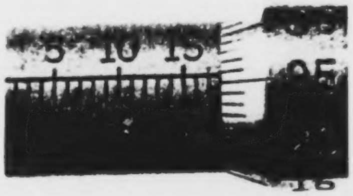


Assignment Sheet 6

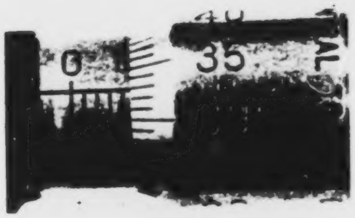
Part B

Directions: Read the settings on the following metric micrometers graduated in 0.01 mm. Write your answers on the blanks.

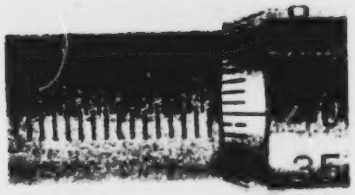
______ 1.



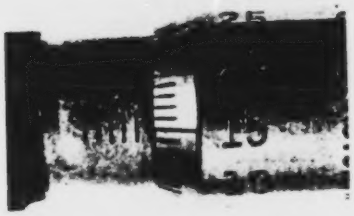
______ 2.



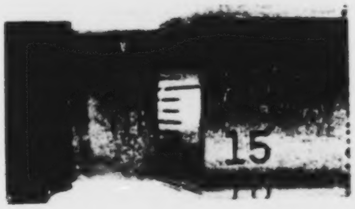
______ 3.



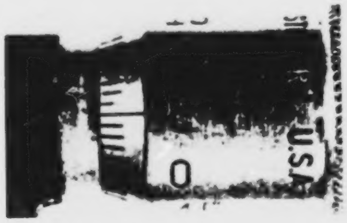
______ 4.



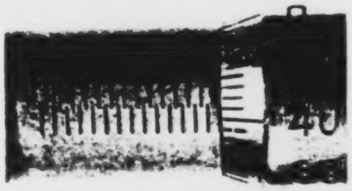
______ 5.



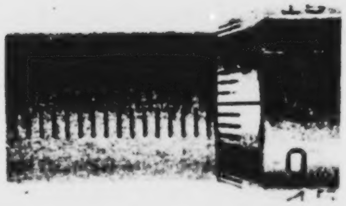
______ 6.



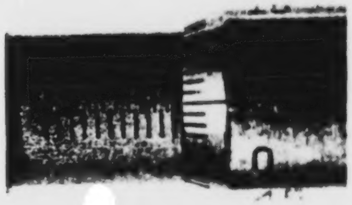
______ 7.



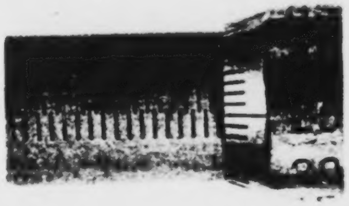
______ 8.



______ 9.



______10.



Measuring
Unit 9

Job Sheet 1—Use Inside and Outside Micrometers

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Followed correct procedure for using outside micrometer	______
Consistently obtained correct outside micrometer reading	______
Followed correct procedure for using inside micrometer	______
Consistently obtained correct inside micrometer reading	______

A. Introduction: The service specialist uses micrometers when relatively high-precision measurements are required.

There are many different types and sizes of micrometers. U.S. customary micrometers are available in sizes from 0.5 inches to 60 inches. Metric micrometers are available in sizes up to 600 millimeters.

Because micrometers are precision instruments, they must be treated with care. Follow the rules for use and care of micrometers listed in Objective 6 of the Information Sheet.

B. Equipment and Materials

- Standard and metric inside-micrometer set with extension rods
- Standard or metric outside micrometer
- Micrometer manufacturer's instructions
- Pencil and paper for recording readings
- Lint-free cloth and light machine oil
- Piece of line of known dimensions to check outside micrometer reading
- Component of standard dimensions to check inside micrometer reading
- Steel rule
- Components to be measured (selected by instructor)

Job Sheet 1

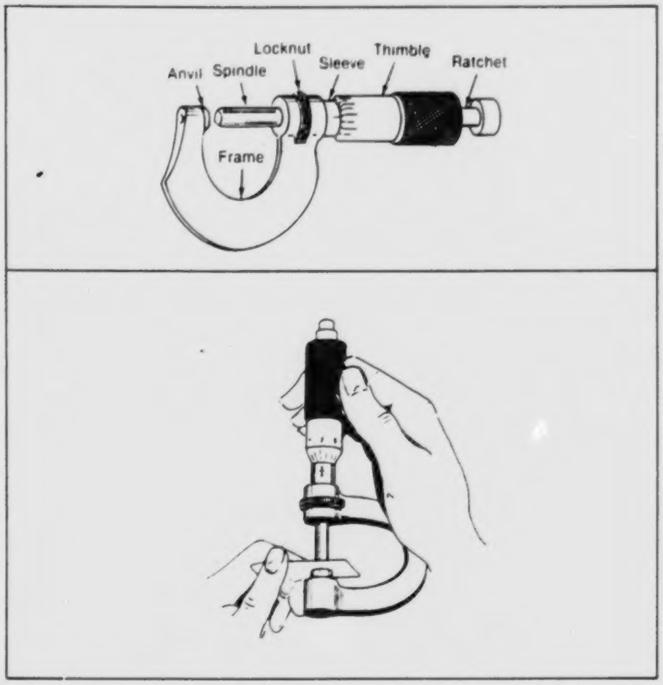
C. Procedure for Using an Outside Micrometer

☐ 1. Select correct-sized micrometer for component you are measuring.

☐ 2. Check component to be measured to be sure that it is free of nicks, burrs, or dents.

☐ 3. Apply light machine oil to lint-free cloth and gently clean micrometer spindle and anvil (see Figure 1).

Figure 1


Locknut
Thimble
Anvil
Spindle
Sleeve
Ratchet
Frame

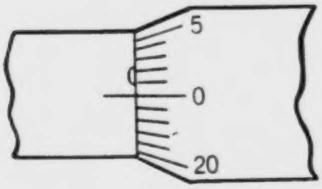
4. Check micrometer at zero reference.

☐ a. Rotate thimble until spindle just touches anvil, and then, turn ratchet until several clicks are heard.

Job Sheet 1

☐ b. Check to see that reference line on sleeve and zero on thimble match up as shown in Figure 2.

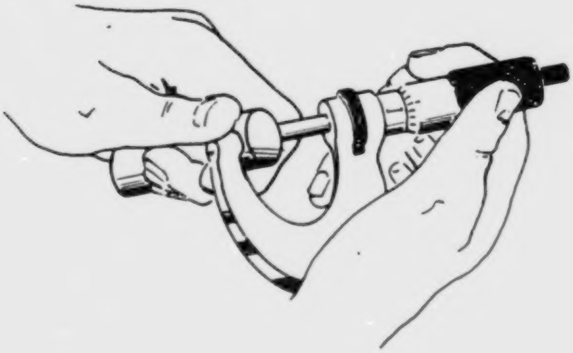
Figure 2



5. Hold micrometer according to type of component being measured.

☐ a. To measure a nonstationary object, hold micrometer in one hand and component in other as shown in Figure 3.

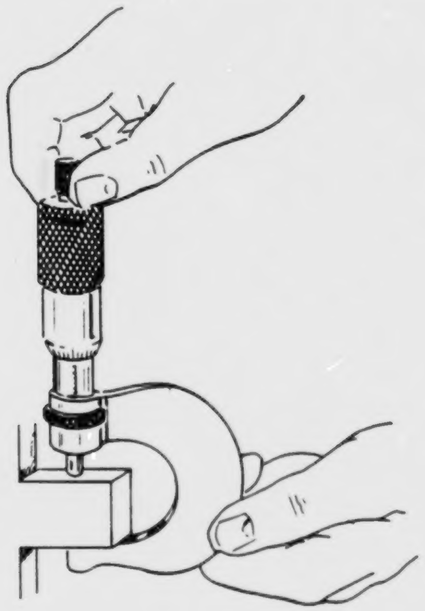
Figure 3



Job Sheet 1

☐ b. To measure a stationary object, hold micrometer in both hands as shown in Figure 4.

Figure 4

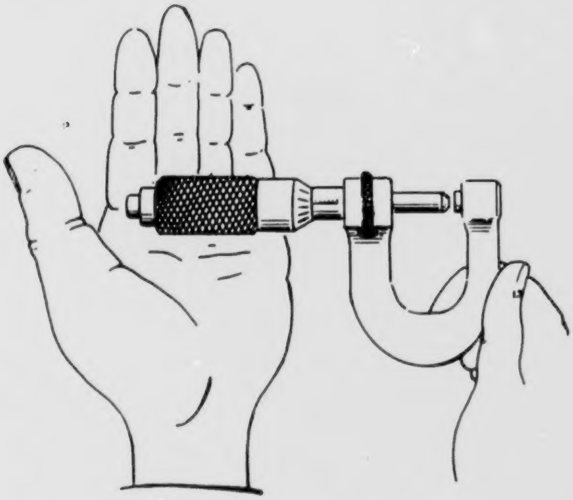


☐ 6. Roll micrometer along palm of hand or forearm for quick adjustment (see Figure 5), and then place directly over center of component to be measured.

Note: Before measuring a component selected by the instructor, check the accuracy of the micrometer by measuring the outside diameter of a piece of line that has a standard dimension. *If* the micrometer reading and the standard dimension are **not** the same, test and use another micrometer.

Job Sheet 1

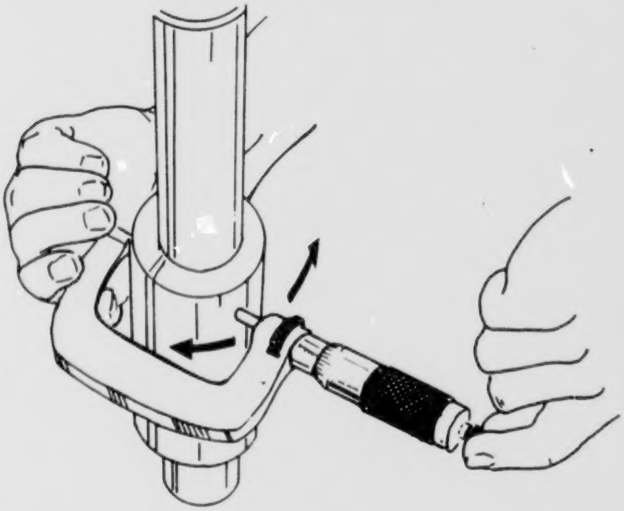
Figure 5



☐ 7. Twist thimble between your thumb and first finger, stopping when spindle just touches component to be measured.

☐ 8. Hold anvil steady and move spindle lightly over component to locate true center line (Figure 6)

Figure 6



Job Sheet 1

☐ 9. If micrometer has a ratchet stop to adjust tightness, turn it until you hear at least two clicks.

☐ 10. Take reading while component is still in micrometer; *if* this is **not** possible, use locknut to lock spindle at correct reading, and then, carefully remove micrometer from component and read measurement (Assignment Sheet 6).

☐ 11. Repeat this process until all components have been measured and measurements have been recorded.

☐ 12. Clean micrometer with a lint-free cloth and return micrometer to its proper storage, leaving the spindle and anvil open for storage.

☐ 13. Clean work area and return tools and equipment to proper storage.

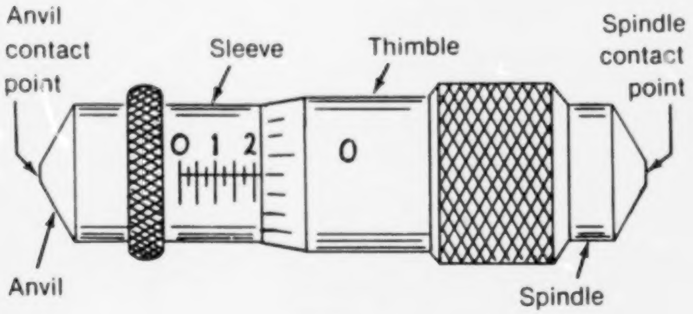
☐ 14. Hand in recorded measurements to your instructor for evaluation.

D. Procedure for Using an Inside Micrometer

☐ 1. Check component to be measured to be sure that it is free of nicks, burrs, or dents.

☐ 2. Apply light machine oil to a lint-free cloth and gently clean anvil and spindle contact points and micrometer accessories (Figure 7).

Figure 7



Job Sheet 1

☐ 3. Check micrometer at zero reference to be sure that reference line on sleeve and zero on thimble match.

☐ 4. Use a steel rule to measure approximate inside diameter of component to be measured.

☐ 5. *If* necessary, select correct extension rod and collar for required measurement.

☐ 6. *If* necessary, select extension collar to utilize full range of extension rod.

☐ 7. *If* necessary, select extension handle for small-hole or deep-hole application.

☐ 8. Follow micrometer manufacturer's instructions and use proper tools to assemble accessories on micrometer.

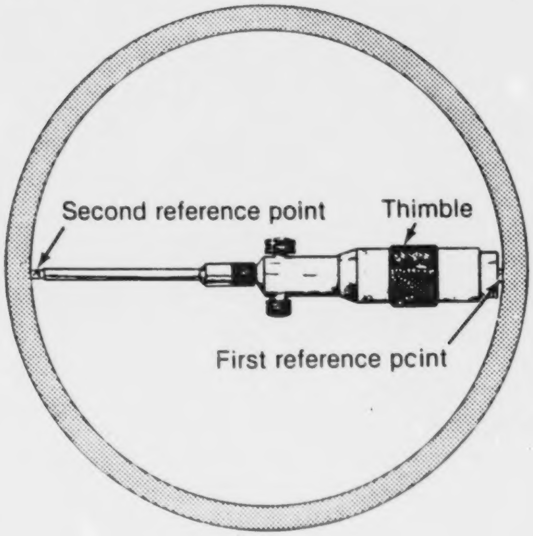
☐ 9. Place micrometer inside component to be measured, and establish reference point for spindle contact point (see Figure 8 on next page).

Note: Before measuring a component selected by the instructor, check the accuracy of the micrometer by measuring the inside diameter of a component that has a standard dimension. *If* the micrometer reading and the standard dimension are **not** the same, test and use another micrometer.

☐ 10. While holding micrometer steady with spindle contact point on reference point, rotate thimble until anvil contact point just touches component wall to establish second reference point (see Figure 8 on next page).

Job Sheet 1

Figure 8



☐ 11. Move spindle contact point from side to side to find true inside diameter of component.

☐ 12. *If* possible, read micrometer while inside component; *if* this is **not** possible, the micrometer locks automatically and may be withdrawn from component for reading.

☐ 13. Read micrometer (Assignment Sheet 6); add to this reading the length of extension rod and collar if applicable.

☐ 14. Repeat this process until all components have been measured and measurements have been recorded.

☐ 15. Disassemble accessories from micrometer, if necessary; clean micrometer with soft, lint-free cloth; and place in proper storage.

☐ 16. Clean work area and return equipment and materials to proper storage.

☐ 17. Hand in recorded measurements to your instructor for evaluation.

Evaluator's comments: ____________________

____

____

Measuring
Unit 9

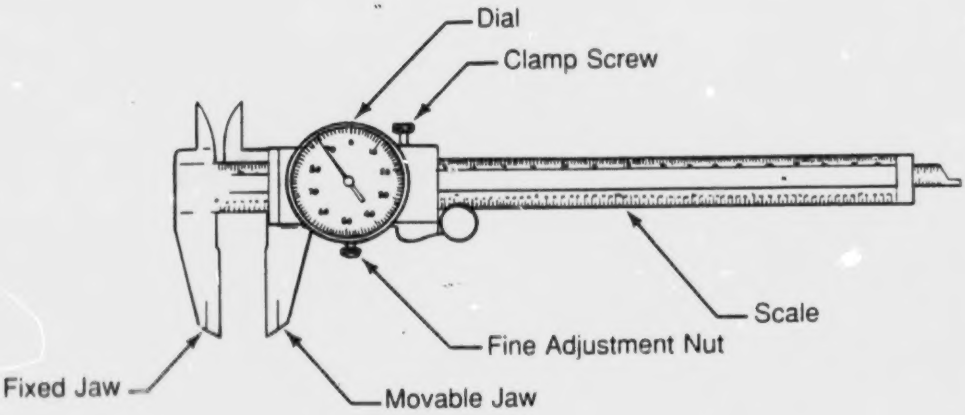
Job Sheet 2—Use a Dial Caliper

Name ______________________________	Attempt Number ________
Date ______________________________	Overall Rating ________

Evaluation criteria	**Rating**
Followed correct procedure for using dial caliper	______
Consistently obtained correct dial-caliper reading	______

A. Introduction: As with inside and outside micrometers, a parts specialist uses a dial caliper (see Figure 1) to make high-precision measurements; however, unlike micrometers, a dial caliper can be used to take both inside and outside measurements of automotive or small engine components.

Figure 1



Also like inside and outside micrometers, dial calipers are precision instruments and must be treated with care. Follow the guidelines for care of dial calipers listed in Objective 14 of the Information Sheet..

B. Equipment and Materials

- Standard or metric dial caliper
- Dial caliper manufacturer's instructions
- Pencil and paper for recording readings
- Lint-free cloth and light machine oil
- Components to be measured (selected by instructor)

Job Sheet 2

C. Procedure

☐ 1. Apply light machine oil to lint-free cloth and gently clean dial caliper.

☐ 2. Follow manufacturer's instructions for adjusting movable jaw on dial caliper until jaws are closed; set dial to zero.

☐ 3. Check component to be measured to be sure that it is free of nicks, burrs, or dents.

☐ 4. Open caliper jaws to a distance slightly greater than the thickness of the component to be measured.

☐ 5. Place the fixed caliper jaw on the component to be measured.

☐ 6. Slide the movable jaw until it also contacts component to be measured.

☐ 7. Tighten clampscrews and fine-adjustment nut as necessary.

Note: Do **not** overtighten clampscrews or fine-adjustment nut.

☐ 8. Carefully remove the caliper from the component to be measured.

☐ 9. Read caliper dial.

☐ 10. Record reading.

☐ 11. Repeat process until all components have been measured and measurements have been recorded.

☐ 12. Clean dial caliper with a lint-free cloth, and return caliper to its proper storage, leaving a gap between the fixed and movable jaws to allow for the expansion and contraction of the metal in the caliper.

☐ 13. Clean work area and return tools and equipment to proper storage.

☐ 14. Hand in recorded measurements to your instructor for evaluation.

Evaluator's comments: ______________________________

____

____

Measuring
Unit 9

Job Sheet 3—Use Telescoping Gauges

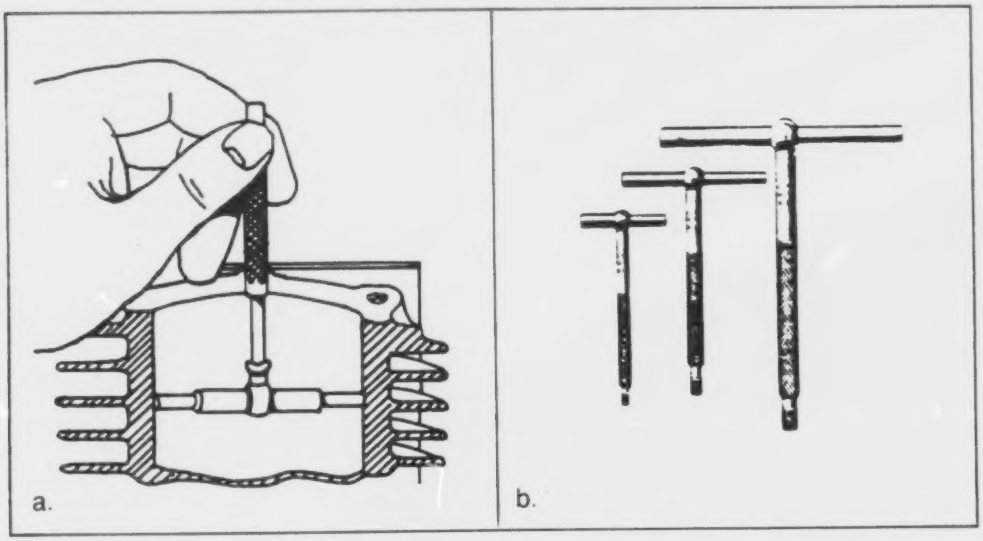
Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Selected correct gauges	______
Followed correct procedure for using telescoping gauges	______
Obtained correct readings	______

A. Introduction: Telescoping gauges are instruments used to measure the internal diameter of parts (see Figure 1-a). The instruments are sold individually or in sets (see Figure 1-b) ranging in size from 5/16 inch to 6 inches.

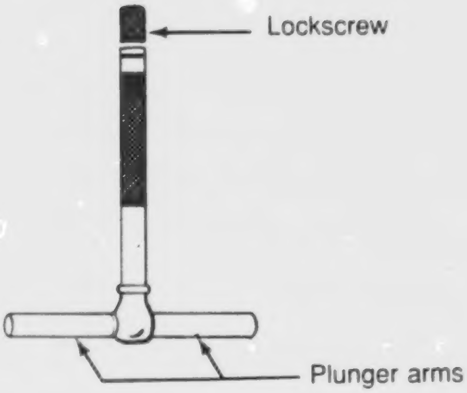
Figure 1



Each gauge consists of two spring-loaded plunger arms (see Figure 2) and a lockscrew. A gauge is inserted into a part opening, and then, the plunger arms are locked in place when the plunger arms reach the sides of the part opening. The gauge is then removed from the part opening and the length of the plunger arms is measured with a micrometer or a dial caliper (see Job Sheets 1 and 2).

Job Sheet 3

Figure 2



B. Equipment and Materials

- Telescoping gauge set
- Outside micrometer or dial caliper
- Pencil and paper for recording readings
- Components to be measured (selected by instructor)

C. Procedure

☐ 1. Select the correct-sized telescoping gauge for the component you are measuring.

☐ 2. Compress the gauge plunger arms until the gauge is slightly smaller than the internal diameter of the component to be measured, and then, tighten the lockscrew to lock the plunger arms in that position.

Note: Do **not** overtighten the lockscrew.

☐ 3. Insert the telescoping gauge into the component, and loosen the lockscrew to allow the plunger arms to extend out to fit the inside diameter of the component.

☐ 4. Check to make certain the plunger arms are at right angles to the component walls so that the measurement will be accurate.

☐ 5. When the plunger arms are properly aligned, tighten the lockscrew to lock the plunger arms in position.

Note: Do **not** overtighten the lockscrew.

Job Sheet 3

☐ 6. Test for exact internal diameter by rotating the gauge against the component walls; *if* the gauge sticks or does not remain against the component walls throughout the rotation, repeat steps above to refit the gauge.

☐ 7. Using a sweeping motion, remove the gauge from the component.

☐ 8. Measure the length of the plunger arms with a micrometer or a dial caliper (see Job Sheet 1 and Job Sheet 2); record reading.

☐ 9. Repeat process on remaining components until all components have been measured and measurements have been recorded.

☐ 10. Clean telescoping gauges and return to proper storage.

☐ 11. Clean work area and return tools and equipment to proper storage.

☐ 12. Hand in the recorded measurements to your instructor for evaluation.

Evaluator's comments: ______________________________

____

____

Measuring
Unit 9

Job Sheet 4—Use a Dial Indicator

Name ______________________ Attempt Number ______

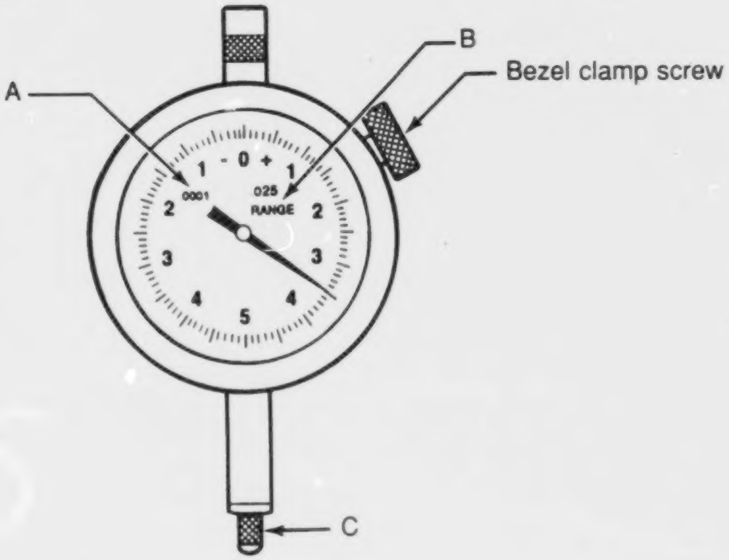
Date ______________________ Overall Rating ______

Evaluation criteria	**Rating**
Followed correct procedure for using dial indicator	______
Consistently obtained correct dial-indicator readings	______

A. Introduction: Dial indicators are precision instruments designed to measure small amounts of movement. They may be graduated in thousandths of an inch or hundredths of a millimeter.

A parts specialist should be able to take a correct reading from a dial indicator. Refer to the dial indicator illustrated in Figure 1 below as you read the following information on making a correct reading.

Figure 1



Job Sheet 4

The size of the smallest graduation on the dial is given by the number labeled *A* in Figure 1. On this dial indicator, each graduation is one ten thousandths of an inch. The range number, labeled *B* in Figure 1, shows the largest dimension the indicator can measure. This relates to the amount of movement possible by the stem, *C*, within the indicator. On the dial indicator in Figure 1, the range is twenty-five thousandths of an inch. The same type of information is found on metric dial indicators. The indicator above may be read with the pointer moving either left or right.

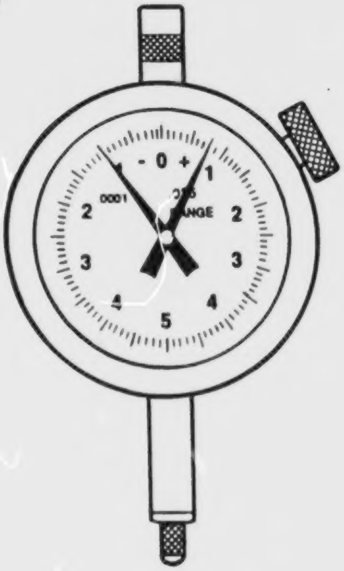
To make a reading, check the size of the smallest graduation and count. The numbered graduations are usually thousandths. Thus, the reading on the dial indicator in Figure 1 is 0.0031 inch. Had the pointer been pointing to the same graduation on the left side of the indicator, the reading would have been –0.0031 inch.

Remember the following guidelines when reading a dial indicator:

- On some indicators, the pointer can go around two and one-half times without a counter. To keep track of the readings, you must count the revolutions of the pointer.

- For some dial-indicator uses, you must measure what is called *total* (or *full*) *runout*. This occurs when the pointer moves both in the plus and minus directions. To get total dial-indicator runout, you must add the readings in both directions. An example is shown in Figure 2 below. The total runout is .10 mm plus .08 mm, which equals .18 millimeters.

Figure 2



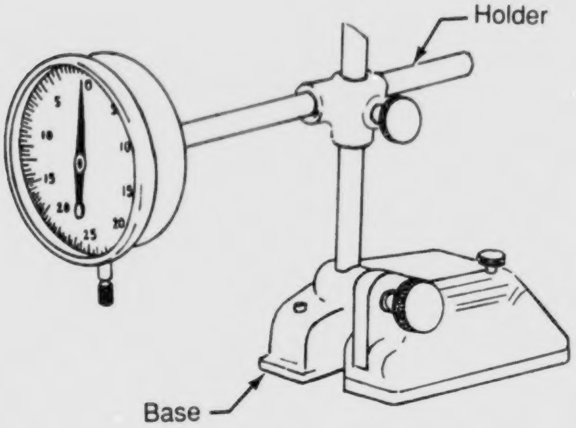
Job Sheet 4

- The bezel and dial may be rotated to set the zero on the dial under the pointer in any position. The bezel clamp screw (see Figure 1) then holds the new position.

B. Equipment and Materials

- Dial indicator
- Dial-indicator holder (see Figure 3)
- Base on which to mount dial-indicator holder (see Figure 3)
- Pencil and paper for recording readings
- Eye protection
- Components to be measured (selected by instructor)

Figure 3



C. Procedure

☐ 1. Check component to be measured to be sure that it is clean and free of burrs, nicks, or dents.

☐ 2. Attach dial indicator to holder.

☐ 3. Attach holder base.

☐ 4. Secure assembled dial-indicator, holder, and base to work surface.

☐ 5. Position holder so that dial-indicator plunger contacts component to be measured.

☐ 6. Adjust holder so that plunger is depressed two revolutions of pointer, and then tighten holder.

Job Sheet 4

☐ 7. Rotate bezel until zero mark is in line with end of pointer.

☐ 8. Measure component.

☐ 9. Record measurement.

☐ 10. Repeat steps 5 through 9 until all components have been measured and measurements have been recorded.

☐ 11. Disassemble dial indicator, holder, and base; return to proper storage.

☐ 12. Hand in the recorded measurements to your instructor for evaluation.

Evaluator's comments: ______________________________

____

____

Stocking, Shipping, and Receiving
Unit 10

Objective Sheet

Unit Objective

After completing this unit, the student should be able to identify forms used for shipping and receiving merchandise, check in and stock parts, and fill and pack an order. The student should demonstrate these competencies by completing the job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to stocking, shipping, and receiving with their correct definitions.
2. Select true statements concerning the organization of parts bins.
3. List forms of transportation used in shipping parts.
4. Identify forms used in shipping parts.
5. Define methods of payment used in shipping and receiving parts.
6. Select true statements concerning the procedure for receiving shipments.
7. Arrange in order the steps for filling and packing an order.
8. Arrange a parts bin. (Job Sheet 1)
9. Check in and stock parts. (Job Sheet 2)
10. Fill and pack an order. (Job Sheet 3)

Stocking, Shipping, and Receiving
Unit 10

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Also note suggested resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Arrange for a local parts dealer to visit the class to discuss this unit and its application to the work of a parts specialist.
- Arrange for a field trip to a shipping terminal to determine how parts and freight are transported, received, sorted, and reshipped to final delivery points.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms related to stocking, shipping and receiving with their correct definitions.

- Read and discuss terms and definitions, giving the class examples of each, and encouraging class members to discuss the terms in light of their own experiences. **(Listening for content; orally expressing a thought)**

Objective 2 Select true statements concerning the organization of parts bins.

- Read and discuss reasons for orderly parts bin organization.

  Visit a local parts store to see how parts bins are organized and arranged. Instruct students to take notes on what parts are stocked where, and give reasons why. **(Listening for content; writing; communicating a thought or idea; adapting to the organization's values and culture)**

- Distribute Job Sheet 1, "Arrange a Parts Bin." Demonstrate proper techniques following steps in the job sheet. Answer any questions, then have students complete Job Sheet 1. **(Listening for content and directions)**

Objective 3 List forms of transportation used in shipping parts.

- Read and discuss various methods used to ship parts locally and across the world. Engage the students in discussion of these forms, and direct them to discuss various costs and advantages of the different methods. **(Listening for content; communicating a thought or idea in a clear, concise manner)**

Objective 4 Identify forms used in shipping parts.

- Distribute examples of various forms included in this unit and discuss the need for each and how each helps ensure proper delivery of the correct part to the correct customer. **(Listening for content)**

- Instruct students on how forms are to be completed, and allow students to fill out samples of these forms. **(Following directions; adapting to the organization's goals and values)**

Suggested Activities

Objective 5 Define methods of payment used in shipping and receiving parts.

- Read and discuss various methods of payments. Engage students in scenarios using each method to determine why one method is preferable to another from the customer or the seller's standpoint. **(Listening for content; applying technical information)**

Objective 6 Select true statements concerning the procedure for receiving shipments.

- Read and discuss the listed procedures. **(Listening for content)**
- Distribute Job Sheet 2, "Check in and Stock Parts." Demonstrate proper procedure for receiving shipments following the steps in the job sheet. Answer any questions, then have students complete Job Sheet 2. **(Listening for content and directions)**

Objective 7 Arrange in order the steps for filling and packing an order .

- Read and discuss the material devoted to filling and packing an order. Lead a class discussion on the importance of each step. **(Listening for content; orally communicating a thought)**
- Distribute Job Sheet 3, "Fill and Pack an Order." Demonstrate the proper procedure for filling and packing an order following the steps in the job sheet. Answer any questions, then have students complete Job Sheet 3. **(Listening for content and directions)**

Evaluation

- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test and job-sheet scores on the Unit Evaluation Form.
- Reteach and retest as required.

Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- Kinzer, Lowery G., and Mary-Anne Howard. *Merchandising.* Santa Fe, NM 87501: Vocational-Technical Education, Office of the New Mexico State Department of Education.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management.* Albany, NY: Delmar Publishers, Inc., 1989.
- Notgrass, Troy. *Auto Parts Counterworker.* Austin, TX: Instructional Materials Center, University of Texas.
- Notgrass, Troy. *Auto Partsman. Coordinator's Guide.* Austin, TX: Instructional Materials Center, University of Texas.
- Notgrass, Troy. *Automotive Parts Clerk.* Austin, TX: Instructional Materials Center, University of Texas, 1986.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Suggested Activities

- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.
No—Is unable to perform job satisfactorily.

Stocking, Shipping, and Receiving
Unit 10

Answers to Written Test

1. a. 4
   b. 2
   c. 1
   d. 3

2. c, f, g, i

3. Any four of the following:

   a. U.S. Postal Service
   b. United Parcel Service
   c. Bus lines
   d. Truck lines
   e. Train
   f. Air express
   g. Ship
   h. Company vehicles
   i. Courier services

4. a. Bill of lading
   b. Call tag
   c. Shipping receipt
   d. Packing slip
   e. Invoice

5. a. COD—The person receiving parts pays carrier for them when they are delivered; the transportation charges are paid either by the shipper or the purchaser depending on their agreement.
   b. Prepaid—The seller pays the transportation costs before shipping the merchandise.
   c. Freight collect—The person receiving parts pays the carrier for the freight upon receipt of parts.

6. a. 2, 3
   b. 3

7. a. 6
   b. 3
   c. 5
   d. 9
   e. 2
   f. 4
   g. 1
   h. 8
   i. 7

Stocking, Shipping, and Receiving
Unit 10

Written Test

Name ______________________________ Score ____________

1. Match terms related to stocking, shipping, and receiving with their correct definitions. Write the numbers on the blanks provided below.

_____a. Any one of several types of adjustable shelves used to store parts

_____b. A request made by phone or mail for some dealer or parts store to ship goods

_____c. An order for merchandise that is not currently in stock but will be delivered when it becomes available

_____d. Those parts which sell very quickly

1. Back order
2. Order
3. Fast moving parts
4. Bin

2. Select true statements concerning the organization of parts bins by placing an "X" in the appropriate blanks.

_____a. Arrangement of bins will not affect the speed and accuracy of a parts person.

_____b. For easy access and adequate lighting, parts bins are usually not over 5 feet tall.

_____c. Parts bins are often arranged in double rows, back to back.

_____d. Aisles between parts bins should be 12 inches wide to assure easy access.

_____e. Wooden bins are more adaptable than metal ones because the shelves are movable and the sections can be made larger or smaller.

_____f. The most common method of bin arrangement is a group system in which related parts are stored in the same group of bins.

_____g The bulk, shape, and weight of an item, in addition to how quickly it will sell, makes a difference in where it is stored.

Written Test

______ h. The new stock is always sold first, so it is a good practice to put the new items in front of the old stock on the shelves.

______ i. Stock is usually stored in bins either alphabetically or by numerical part number sequence.

______ j. Rubber parts or gaskets should be stored in a warm, moist place because cool, dry air can ruin them.

3. List four forms of transportation used in shipping parts.

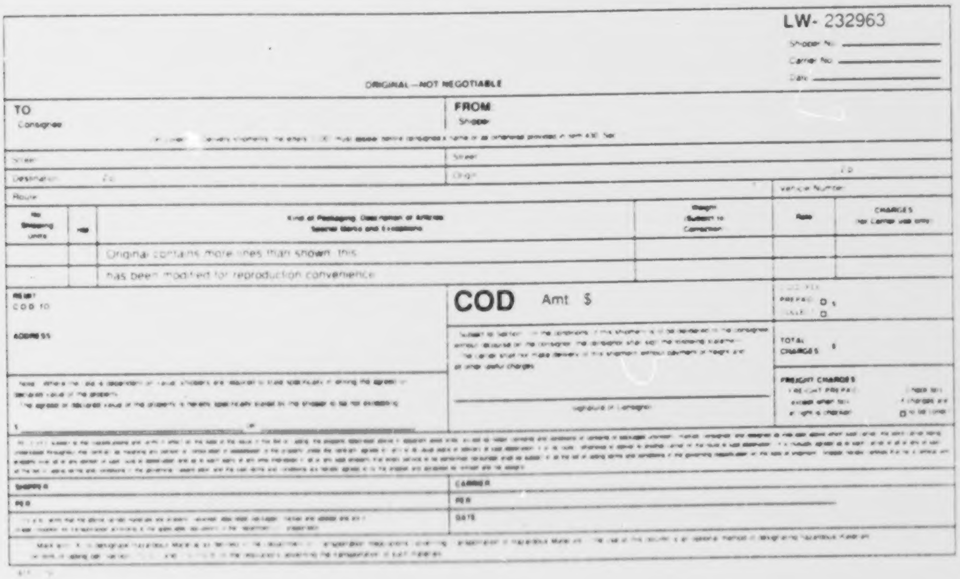
   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

4. Identify forms used in shipping parts.



LW- 232963
Shipper No. ______
Carrier No. ______
Date ______

ORIGINAL—NOT NEGOTIABLE

TO Consignee			FROM Shipper		
Street			Street		
Destination Zip			Origin Zip		
Route				Vehicle Number	
No. Shipping Units	HM	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (Subject to Correction)	Rate	CHARGES (for Carrier use only)
		Original contains more lines than shown; this			
		has been modified for reproduction convenience			

REMIT COD TO

ADDRESS

COD Amt $

Signature of Consignor

TOTAL CHARGES $

FREIGHT CHARGES

SHIPPER

PER

CARRIER

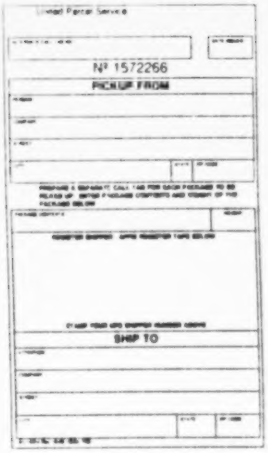
PER

DATE

a. ______________________

BEST COPY AVAILABLE

Written Test



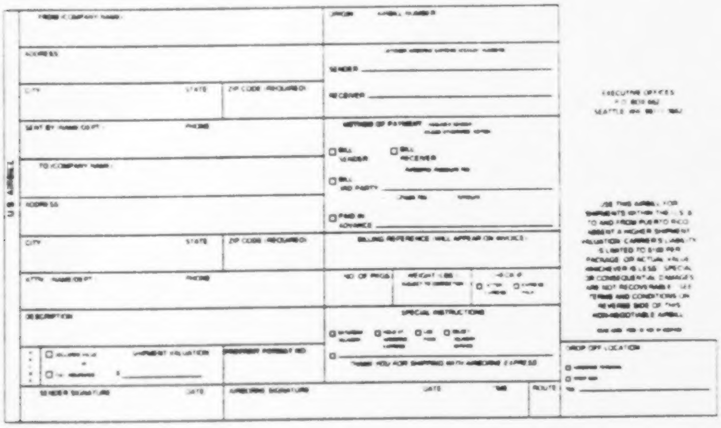
United Parcel Service

Nº 1572266

PICKUP FROM

SHIP TO

b. ______________________



U.S. AIRBILL

FROM (COMPANY NAME)

ADDRESS

CITY — STATE — ZIP CODE (REQUIRED)

SENT BY (NAME/DEPT.) — PHONE

TO (COMPANY NAME)

ADDRESS

CITY — STATE — ZIP CODE (REQUIRED)

ATTN: (NAME/DEPT.) — PHONE

DESCRIPTION

SHIPMENT VALUATION

SENDER SIGNATURE — DATE

AIRBORNE SIGNATURE — DATE — ROUTE

SENDER ______

RECEIVER ______

METHOD OF PAYMENT

☐ BILL SENDER ☐ BILL RECEIVER

☐ BILL 3RD PARTY ______

☐ PAID IN ADVANCE ______

BILLING REFERENCE (WILL APPEAR ON INVOICE)

NO. OF PKGS. — WEIGHT (LBS.)

SPECIAL INSTRUCTIONS

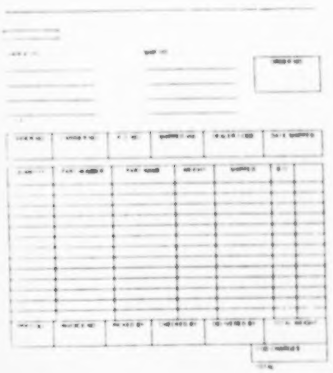
☐ ______

THANK YOU FOR SHIPPING WITH AIRBORNE EXPRESS

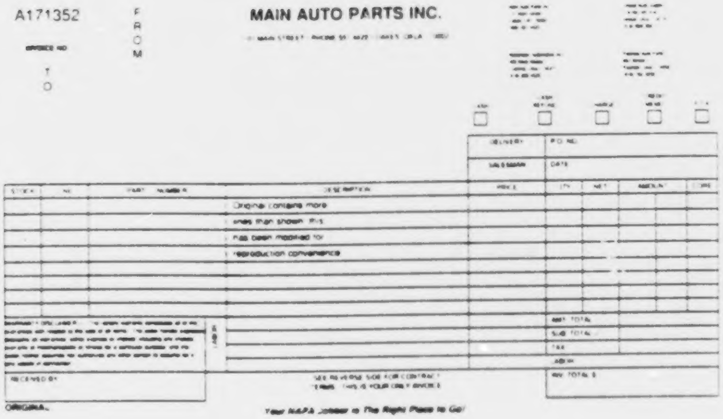
EXECUTIVE OFFICES
P.O. BOX 662
SEATTLE, WA

DROP OFF LOCATION

c. ______________________



d. ______________________



A171352

INVOICE NO.

FROM

MAIN AUTO PARTS INC.

TO

DELIVERY

P.O. NO.

SALESMAN

DATE

DESCRIPTION

PRICE

AMOUNT

Original contains more lines than shown. This has been modified for reproduction convenience

PART TOTAL

SUB TOTAL

TAX

LABOR

INV. TOTAL $

RECEIVED BY

SEE REVERSE SIDE FOR CONTRACT TERMS. THIS IS YOUR ONLY INVOICE

ORIGINAL

Your NAPA Jobber is The Right Place to Go!

e. ____________________

5. Define methods of payment used in shipping and receiving parts.

a. COD — ____________________

b. Prepaid — ____________________

c. Freight collect — ____________________

6. Select true statements concerning the procedure for receiving shipments by placing an "X" in the appropriate blanks.

a. Accepting the shipment from the transportation company

_____ (1) Sign the shipping receipt first so the transportation company employee can leave.

_____ (2) Make sure all parcels are addressed to your company.

_____ (3) Count number of packages delivered and make sure that number corresponds to the number listed on the bill of lading or shipping receipt.

b. Checking in individual parts received

_______(1) First, give packing slip to manager to be filed immediately.

_______(2) Shipping receipts and purchase orders do not need to be handy because if you deal with a reputable shipping company, there won't be any discrepancies.

_______(3) As you unpack each item, make sure it is tagged with the correct part number so it can be stored in its proper bin as soon as possible.

7. Arrange in order the steps for filling and packing an order by placing the correct sequence number in the appropriate blank.

_______a. Prepare an invoice indicating quantity, description, and prices of merchandise being shipped for customer.

_______b. Choose a container strong enough to hold all merchandise being shipped.

_______c. When all items have been packed, place the packing slip in one of the boxes or attach it securely to the outside of a package.

_______d. Ship order to customer.

_______e. Pull parts to be shipped from stock.

_______f. Mark each item off the checklist as it is packed and place packing material in and around the merchandise to avoid damage during shipping.

_______g. Have checklist of all parts to be packed.

_______h. Be certain to tape, tie, or strap packages according to post office or transportation company's requirements.

_______i. Prepare the packages for shipment by putting customer's address, return address, and any other necessary instructions such as "FRAGILE" or "THIS SIDE UP" on package.

***Permission to duplicate this test is granted.**

Stocking, Shipping, and Receiving
Unit 10

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Job Sheet 1—Arrange a Parts Bin Rating ______

Comments: ____

____

Job Sheet 2—Check In and Stock Parts Rating ______

Comments: ____

____

Job Sheet 3—Fill and Pack an Order Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

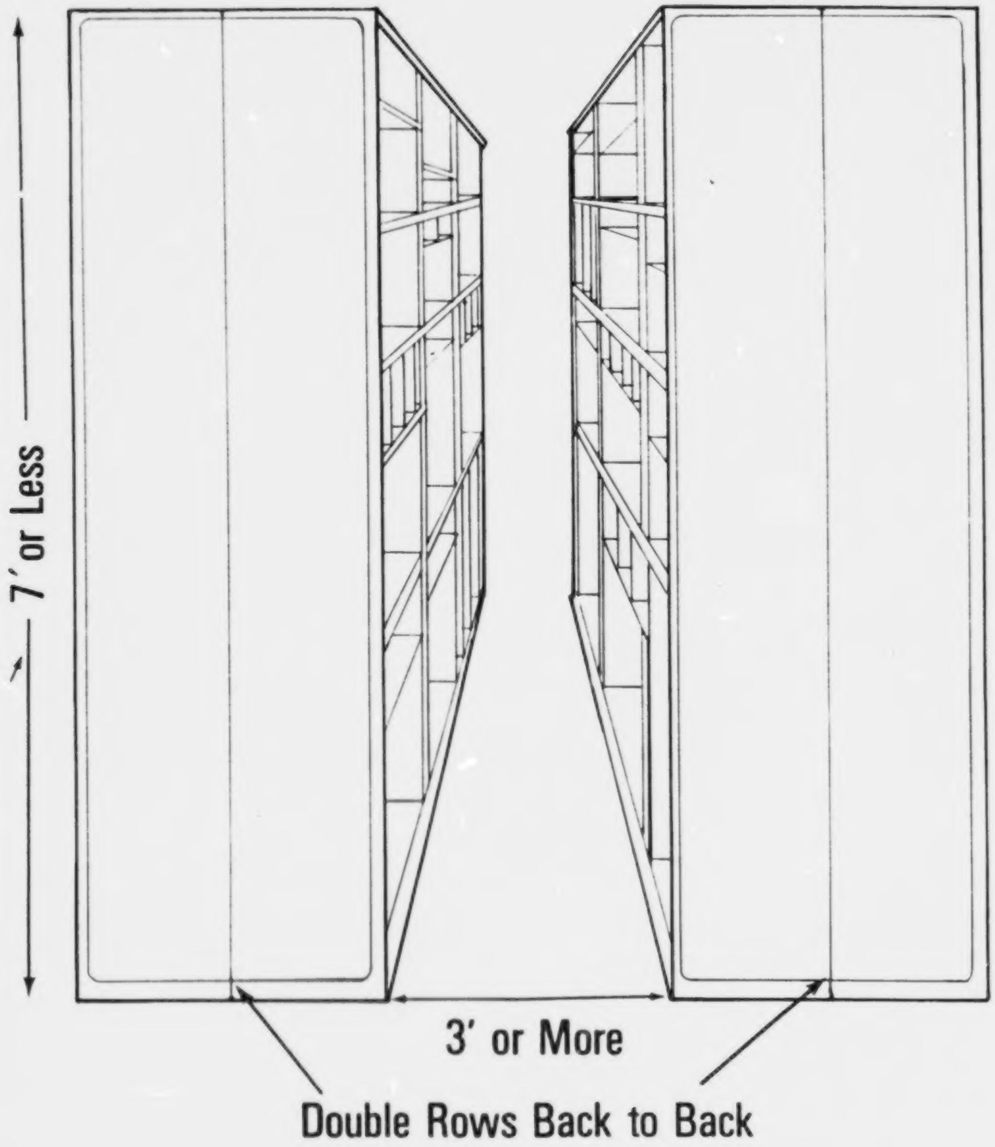
____

Teacher Signature ______________________________ Date __________

Student Signature ______________________________ Date __________

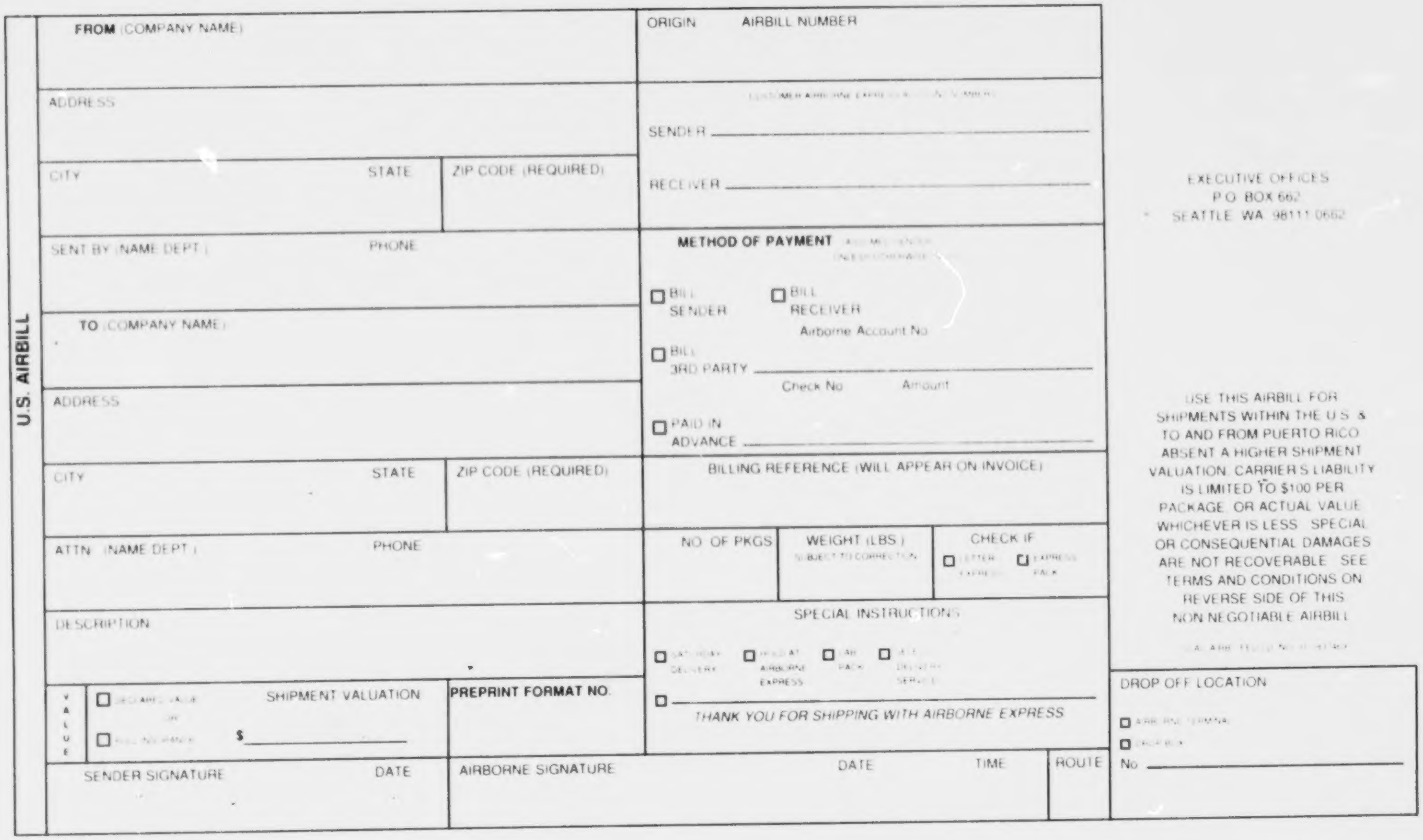
***Permission to duplicate this form is granted.**

Typical Parts Bin Arrangement


7' or Less
3' or More
Double Rows Back to Back

716

Shipping Receipt



U.S. AIRBILL

FROM (COMPANY NAME)

ADDRESS

CITY STATE ZIP CODE (REQUIRED)

SENT BY (NAME DEPT.) PHONE

TO (COMPANY NAME)

ADDRESS

CITY STATE ZIP CODE (REQUIRED)

ATTN (NAME DEPT.) PHONE

DESCRIPTION

VALUE
☐ DECLARED VALUE
OR
☐ [illegible]
SHIPMENT VALUATION
$ ____________

PREPRINT FORMAT NO.

SENDER SIGNATURE DATE

AIRBORNE SIGNATURE DATE TIME ROUTE

ORIGIN AIRBILL NUMBER

CUSTOMER AIRBORNE EXPRESS ACCOUNT NUMBER
SENDER ____________
RECEIVER ____________

METHOD OF PAYMENT [illegible]

☐ BILL SENDER
☐ BILL RECEIVER
Airborne Account No
☐ BILL 3RD PARTY ____________
Check No Amount
☐ PAID IN ADVANCE ____________

BILLING REFERENCE (WILL APPEAR ON INVOICE)

NO. OF PKGS

WEIGHT (LBS.) SUBJECT TO CORRECTION

CHECK IF
☐ LETTER EXPRESS ☐ EXPRESS PACK

SPECIAL INSTRUCTIONS
☐ SATURDAY DELIVERY ☐ HOLD AT AIRBORNE EXPRESS ☐ LAB PACK ☐ [illegible] DELIVERY SERVICE
☐ ____________

THANK YOU FOR SHIPPING WITH AIRBORNE EXPRESS

EXECUTIVE OFFICES
P.O. BOX 662
SEATTLE WA 98111 0662

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE U.S. & TO AND FROM PUERTO RICO. ABSENT A HIGHER SHIPMENT VALUATION, CARRIER'S LIABILITY IS LIMITED TO $100 PER PACKAGE, OR ACTUAL VALUE WHICHEVER IS LESS. SPECIAL OR CONSEQUENTIAL DAMAGES ARE NOT RECOVERABLE. SEE TERMS AND CONDITIONS ON REVERSE SIDE OF THIS NON NEGOTIABLE AIRBILL

DROP OFF LOCATION
☐ AIRBORNE TERMINAL
☐ DROP BOX
No ____________

Packing Slip

PACKING SLIP

CHARGE TO

SHIP TO

ORDER NO.

ORDER NO.	CARRIER NO.	P.O. NO.	SHIPPED VIA	DEALER CODE	DATE SHIPPED

QUANTITY	PART NUMBER	PART NAME	WEIGHT	SHIPPED	B.O.	

PPP/COLL.	INVOICE NO.	PICKED BY	CHECKED BY	DELIVERED BY	TOTAL WEIGHT

COD CHARGES
TOTAL

719

Invoice or Counter Ticket

A171352

INVOICE NO

F R O M

MAIN AUTO PARTS INC.

101 MAIN STREET • PHONE 551 4422 • OAKES, OKLA 70002

T O

CASH ☐ CASH REFUND ☐ CHARGE ☐ CREDIT MEMO ☐ R.O.A. ☐

DELIVERY	P.O. NO
SALESMAN	DATE

STOCK	LINE	PART NUMBER	DESCRIPTION	PRICE	QTY	NET	AMOUNT	CORE
			Original contains more					
			lines than shown, this					
			has been modified for					
			reproduction convenience					
					AMT. TOTAL			
					SUB TOTAL			
					TAX			
					LABOR			
					INV. TOTAL $			

WARRANTY DISCLAIMER — The factory warranty constitutes all of the warranties with respect to the sale of all items. The seller hereby expressly disclaims all warranties either express or implied, including any implied warranty of merchantability or fitness for a particular purpose, and the seller neither assumes nor authorizes any other person to assume for it any liability in connection.

LABOR

RECEIVED BY

ORIGINAL INVOICE

SEE REVERSE SIDE FOR CONTRACT TERMS. THIS IS YOUR ONLY INVOICE

Your NAPA Jobber is The Right Place to Go!

Parts Specialist: Unit 10
Teacher Page 23

TM 4

Bill of Lading

LW- 232963

Shipper No. ______

Carrier No. ______

Date ______

STRAIGHT BILL OF LADING
ORIGINAL—NOT NEGOTIABLE

TO:
Consignee

FROM:
Shipper

On Collect on Delivery shipments, the letters "COD" must appear before consignee's name or as otherwise provided in Item 430, Sec. [illegible]

Street

Destination Zip

Street

Origin Zip

Route

Vehicle Number

No. Shipping Units	* HM	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (Subject to Correction)	Rate	CHARGES (for Carrier use only)
		Original contains more lines than shown; this			
		has been modified for reproduction convenience			

REMIT C.O.D. TO

ADDRESS

COD Amt: $

C.O.D. FEE
PREPAID ☐ $
COLLECT ☐

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

______
Signature of Consignor

TOTAL CHARGES $

FREIGHT CHARGES
FREIGHT PREPAID except when box at right is checked
Check box if charges are ☐ to be collect

Note: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding

$ ______ per ______

[illegible]

SHIPPER

PER

CARRIER

PER ______

DATE

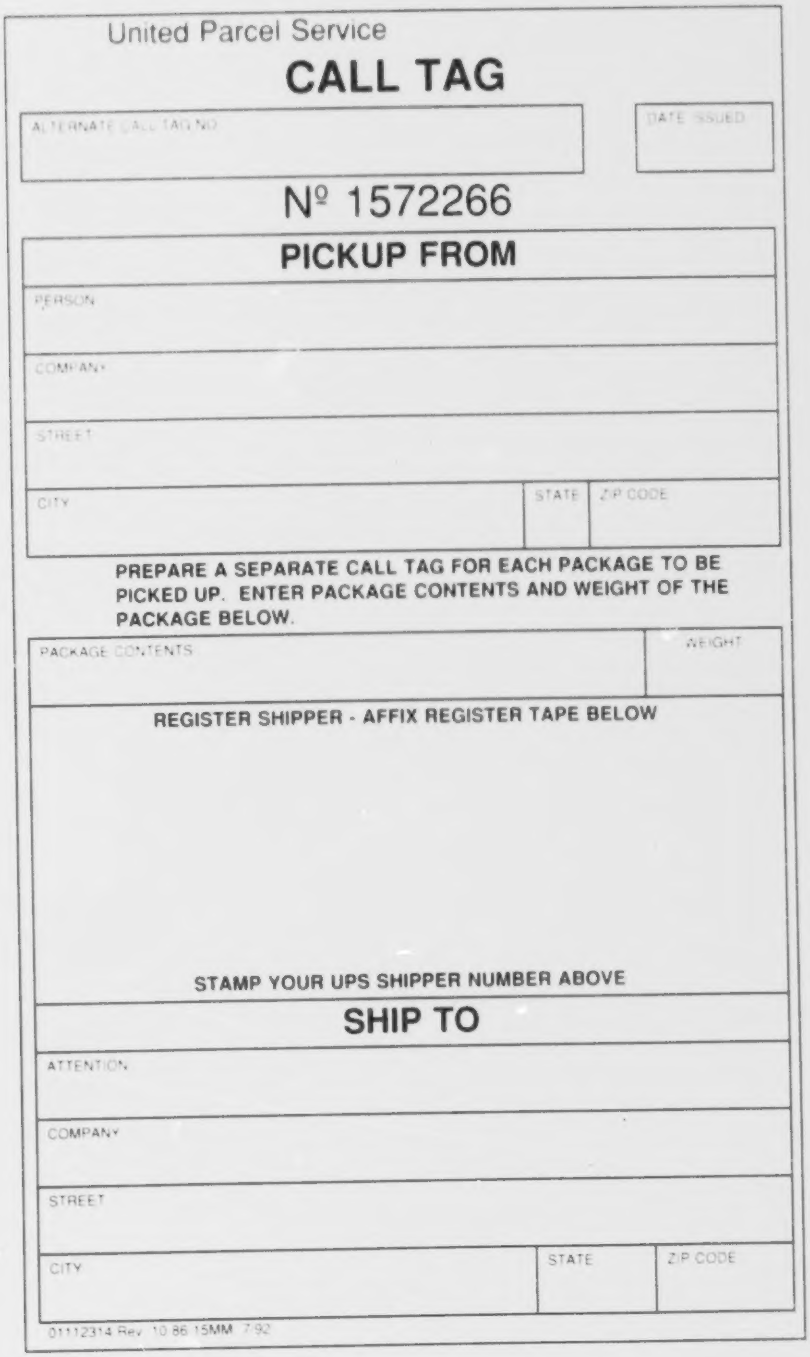
This is to certify that the above named materials are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

* Mark with "X" to designate Hazardous Material as defined in the Department of Transportation Regulations Governing Transportation of Hazardous Materials. The use of this column is an optional method of designating hazardous materials on bills of lading per Section 172.201 and 172.202(b) of the regulations governing the transportation of such materials.

[illegible]

BEST COPY AVAILABLE

Call Tag



United Parcel Service

CALL TAG

ALTERNATE CALL TAG NO.

DATE ISSUED

Nº 1572266

PICKUP FROM

PERSON

COMPANY

STREET

CITY	STATE	ZIP CODE

PREPARE A SEPARATE CALL TAG FOR EACH PACKAGE TO BE PICKED UP. ENTER PACKAGE CONTENTS AND WEIGHT OF THE PACKAGE BELOW.

PACKAGE CONTENTS	WEIGHT

REGISTER SHIPPER - AFFIX REGISTER TAPE BELOW

STAMP YOUR UPS SHIPPER NUMBER ABOVE

SHIP TO

ATTENTION

COMPANY

STREET

CITY	STATE	ZIP CODE

01112314 Rev. 10/86 15MM 7/92

Stocking, Shipping, and Receiving
Unit 10

Information Sheet

1. **Terms and definitions**

   a. **Back order** — An order for merchandise that is not currently in stock but will be delivered when it becomes available

   b. **Bin** — Any one of several types of adjustable shelves used to store parts

   c. **Fast moving parts** — Those parts which sell very quickly

   Examples: Tune up parts, oil filters, and anti-freeze/coolant (in season).

   d. **Order** — A request made by phone or mail for some dealer or parts store to ship goods

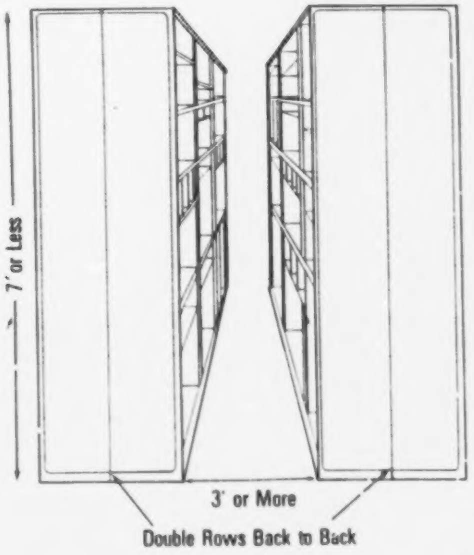
2. **Parts bin organization**

   a. Arrangement of bins will affect speed and accuracy of a parts person.

   b. For easy access and adequate lighting, parts bins are usually not over 7 feet tall.

   c. Parts bins are often arranged in double rows, back to back.

   d. Aisles between parts bins should be 3 feet wide to assure easy access.



Information Sheet

e. Metal bins are more adaptable than wooden bins because the shelves are moveable and the sections can be made larger or smaller.

f. The bulk, shape, and weight of an item, in addition to how quickly it will sell, makes a difference in where it is stored.

g. Fast moving items should be close at hand and easy to reach.

h. The old stock is always sold first, so it is a good practice to put the new items behind the old stock on the shelves.

Note: This is sometimes referred to as First In First Out (FIFO) management.

i. Stock is usually stored in bins either alphabetically or by numerical part number sequence.

j. Rubber parts or gaskets should be stored in a cool, dry place because heat can ruin them.

k. To prevent fires in the store or warehouse, paint and other flammable liquids should be stored in cool, ventilated places.

l. Special bins or racks are desirable for odd-shaped items such as hoses, belts, and tailpipes.

Note: Regardless of the method of bin organization an employer uses, the greater care a parts person takes in stocking merchandise, the fewer problems arise in identifying and locating parts.

3. Forms of transportation used in shipping parts

a. Air express (Airborne, Federal Express, UPS next day service)

Note: These services, along with overnight U.S. Postal Service, are expensive, but very dependable when next-day delivery is required. These services depend upon a central collecting point where orders are placed on airliners and cargo jets to be delivered anywhere in the U.S. within one to eight hours. In the case of Federal Express, all shipments are processed in Memphis, Tenn.

b. Bus lines (Greyhound, Continental Trailways, MK&O)

c. Company vehicles

d. Courier services

e. Ship (Ocean going vessels are used to import parts for vehicles built outside North America)

Information Sheet

f. Truck lines (Roadway, RPS, Transcon)

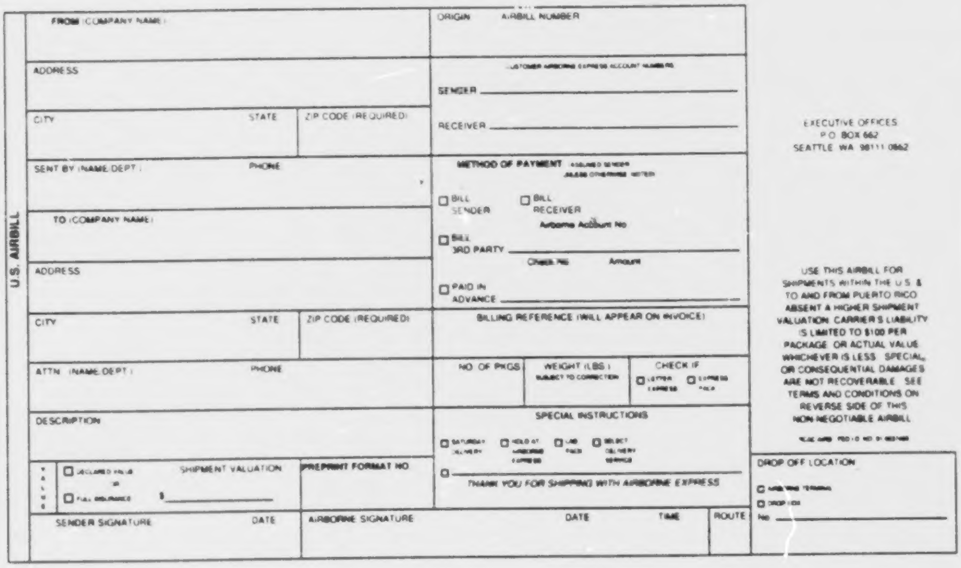
g. United Parcel Service (UPS)

h. U.S. Postal Service

i. Train

4. Forms used in shipping parts

a. **Shipping receipts** — A form showing quantity, description, weight, and shipping costs of the merchandise being delivered



U.S. AIRBILL

FROM (COMPANY NAME)
ADDRESS
CITY STATE ZIP CODE (REQUIRED)
SENT BY (NAME/DEPT.) PHONE
TO (COMPANY NAME)
ADDRESS
CITY STATE ZIP CODE (REQUIRED)
ATTN (NAME/DEPT.) PHONE
DESCRIPTION
VALUE ☐ DECLARED VALUE or ☐ FULL INSURANCE SHIPMENT VALUATION $
PREPRINT FORMAT NO
SENDER SIGNATURE DATE
AIRBORNE SIGNATURE DATE TIME ROUTE

ORIGIN AIRBILL NUMBER
CUSTOMER AIRBORNE EXPRESS ACCOUNT NUMBERS
SENDER
RECEIVER
METHOD OF PAYMENT (ASSUMED SENDER UNLESS OTHERWISE NOTED)
☐ BILL SENDER ☐ BILL RECEIVER
Airborne Account No
☐ BILL 3RD PARTY
Check No Amount
☐ PAID IN ADVANCE
BILLING REFERENCE (WILL APPEAR ON INVOICE)
NO. OF PKGS WEIGHT (LBS.) SUBJECT TO CORRECTION CHECK IF ☐ LETTER EXPRESS ☐ EXPRESS PAK
SPECIAL INSTRUCTIONS
☐ SATURDAY DELIVERY ☐ HOLD AT AIRBORNE EXPRESS ☐ ☐ SELECT DELIVERY SERVICE
☐
THANK YOU FOR SHIPPING WITH AIRBORNE EXPRESS

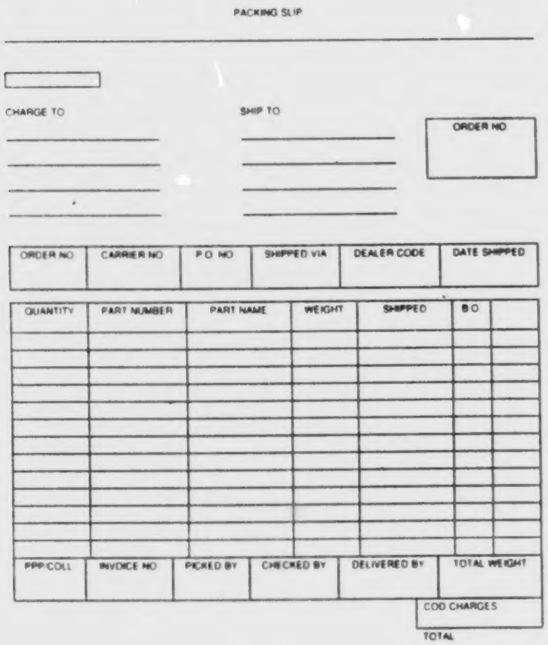
EXECUTIVE OFFICES
P.O. BOX 662
SEATTLE, WA 98111-0662

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE U.S. & TO AND FROM PUERTO RICO. ABSENT A HIGHER SHIPMENT VALUATION, CARRIER'S LIABILITY IS LIMITED TO $100 PER PACKAGE OR ACTUAL VALUE, WHICHEVER IS LESS. SPECIAL OR CONSEQUENTIAL DAMAGES ARE NOT RECOVERABLE. SEE TERMS AND CONDITIONS ON REVERSE SIDE OF THIS NON-NEGOTIABLE AIRBILL.

DROP OFF LOCATION
☐ AIRBORNE TERMINAL
☐ DROP BOX
No.

Information Sheet

b. **Packing slip** — An itemized list packed with the parts which lists the articles to be found in the box or package



PACKING SLIP

CHARGE TO

SHIP TO

ORDER NO

ORDER NO	CARRIER NO	P.O. NO	SHIPPED VIA	DEALER CODE	DATE SHIPPED

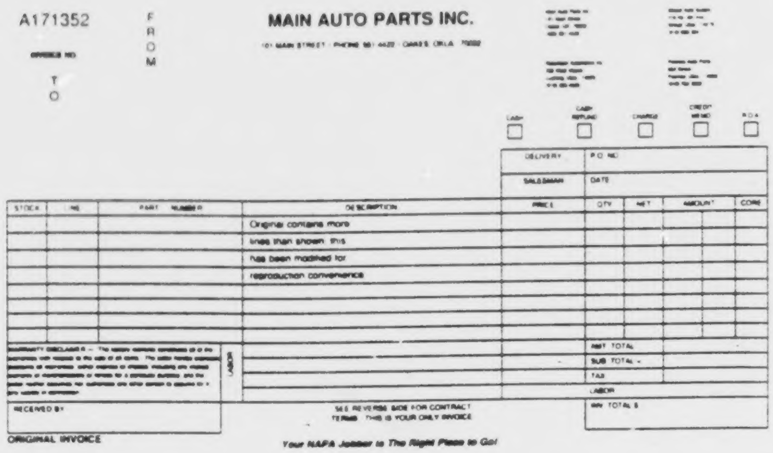
QUANTITY	PART NUMBER	PART NAME	WEIGHT	SHIPPED	B.O.	

PPP/COLL	INVOICE NO	PICKED BY	CHECKED BY	DELIVERED BY	TOTAL WEIGHT

COD CHARGES

TOTAL

c. **Invoice** — A form listing the part number, description, and price for each individual part and the total cost of the shipment



A171352

FROM

TO

MAIN AUTO PARTS INC.

CASH ☐ CASH REFUND ☐ CHARGE ☐ CREDIT MEMO ☐ R.O.A. ☐

DELIVERY	P.O. NO
SALESMAN	DATE

STOCK	LINE	PART NUMBER	DESCRIPTION	PRICE	QTY	NET	AMOUNT	CORE
			Original contains more					
			lines than shown: this					
			has been modified for					
			reproduction convenience					

WARRANTY DISCLAIMER —

LABOR

AMT TOTAL

SUB TOTAL

TAX

LABOR

INV TOTAL $

RECEIVED BY

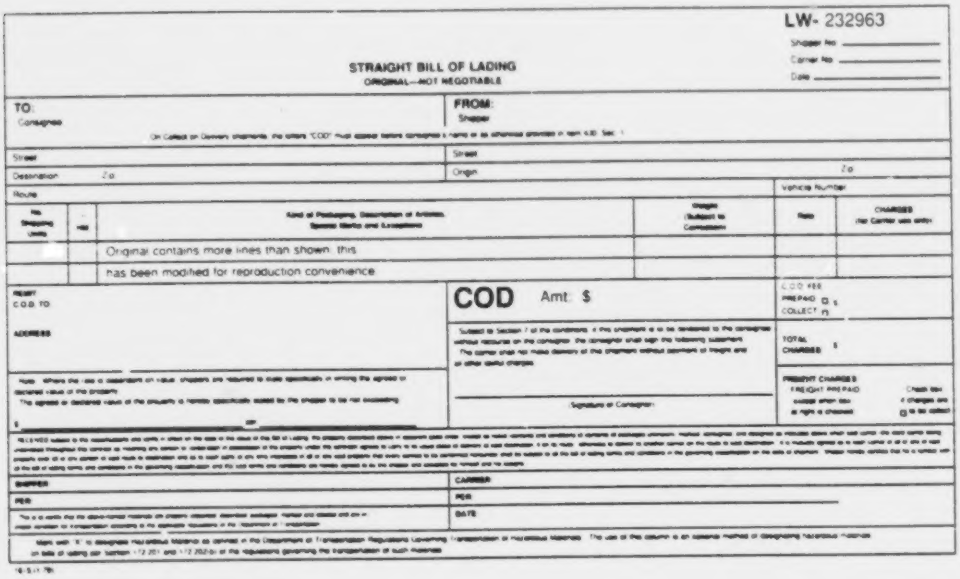
SEE REVERSE SIDE FOR CONTRACT TERMS. THIS IS YOUR ONLY INVOICE

ORIGINAL INVOICE

Your NAPA Jobber is The Right Place to Go!

Information Sheet

d. **Bill of lading** — A form listing quantity and description of goods, plus shipping instructions, to be used in transferring parts from shipper to transportation company



LW- 232963

Shipper No.

Carrier No.

Date

STRAIGHT BILL OF LADING

ORIGINAL—NOT NEGOTIABLE

TO:
Consignee

FROM:
Shipper

Street

Street

Destination Zip

Origin Zip

Route

Vehicle Number

Original contains more lines than shown: this

has been modified for reproduction convenience

REMIT
C.O.D. TO

ADDRESS

COD Amt: $

C.O.D. FEE
PREPAID ☐ $
COLLECT ☐

TOTAL
CHARGES $

Signature of Consignor

FREIGHT CHARGES
FREIGHT PREPAID

SHIPPER

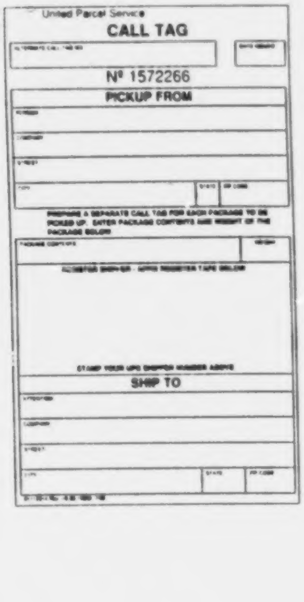
PER

CARRIER

PER

DATE

e. **Call tag** — A form requesting a part be picked up at a designated location



United Parcel Service

CALL TAG

Nº 1572266

PICKUP FROM

SHIP TO

Information Sheet

5. **Methods of payment used in shipping and receiving parts**

   a. **COD (Cash on Delivery)** — The person receiving parts pays carrier for them when they are delivered; the transportation charges are paid either by the shipper or the purchaser depending on their agreement.

   b. **Prepaid** — The seller pays the transportation costs before shipping the merchandise; the sale price, however, reflects the shipping costs, so the customer ultimately pays for the transportation.

   c. **Freight collect** — The person receiving parts pays the carrier for the freight upon receipt of parts.

6. **Procedure for receiving shipments**

   a. Accepting the shipment from the transportation company

      - Make certain all parcels are addressed to your company.
      - Count number of packages delivered, and make certain they correspond to the number listed on the bill of lading or shipping receipt.
      - If there is any sign of damage (such as broken cartons) or a shortage of merchandise, this should be noted on the shipping receipt before it is signed.

        Note: If damages or shortages are noted on the receipt, the delivery person should also sign the receipt, to show that there was a problem with the delivery.

   b. Checking in individual parts received

      - Locate the box or package that contains packing slip.
      - Keep shipping receipt and purchase order (if available) handy when you check in parts to make certain quantity and part numbers match.
      - As you open a box or package, check each item against the packing slip and make note of any parts missing or on "back order".
      - Note any overages, shortages, "special orders," or damages that could not be noticed before the box was opened, and report these discrepancies to your manager.
      - As you unpack each item, make certain it is tagged with the correct part number so it can be stored in its proper bin as soon as possible.

Information Sheet

. 7. **Steps for filling and packing an order**

a. Have checklist of all parts to be packed.

b. Pull parts to be shipped from stock.

c. Choose a container strong enough to hold all merchandise being shipped.

d. Mark each item off the checklist as it is packed and place packing material in and around the merchandise to avoid damage during shipping.

e. When all items have been packed, place the packing slip in one of the boxes or attach it securely to the outside of a package.

- If there is more than one box or package being sent to the same customer, the packing slip goes in only one of the containers.
- Clearly mark that container "Packing Slip Enclosed".
- You may number the boxes so the customer will know in which order they were packed.

  Example: If there are three boxes, mark them 1 of 3, 2 of 3, and 3 of 3.

f. Prepare an invoice indicating quantity, description, and prices of merchandise being shipped for customer.

Note: It is best to put the invoice in an envelope and attach it directly to the package so it goes along with the shipment.

Information Sheet

g. Prepare the packages for shipment by putting customer's address, return address, and any other necessary instructions such as "Fragile" or "This Side Up" on package.

Note: Address labels are especially useful.

Example:

FROM

CONTENTS: Mdse. May Be Opened For Postal Inspection If Necessary
Return Postage Guaranteed

Your Order No.

h. Be certain to tape, tie, or strap packages according to post office or transportation company's requirements.

i. Ship order to customer.

Stocking, Shipping, and Receiving
Unit 10

Job Sheet 1—Arrange a Parts Bin

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Stock was arranged properly within bin	______
Directions were followed	______

A. Introduction: The orderly stocking of parts in a bin can increase the efficiency and accuracy in any parts handling operation. In addition, well organized and properly spaced bins allow for increased safety and ease of parts location.

B. Equipment and Materials

To review how to organize a parts bin, refer to Objective 2 in the Information Sheet.

- Parts bin
- Dividers
- Shelves
- Letters and numbers to identify bins
- Assortment of parts

C. Procedure

☐ 1. Decide how to arrange parts bins in a given area, making most effective use of space provided.

☐ 2. Place shelves and dividers in desired locations, depending on parts to be stored.

☐ 3. Label bins in either numerical or alphabetical sequence.

☐ 4. Stock parts in bins, taking into consideration the bulk, shape, weight, and rate of sale of the items.

Note: Place heavier items on bottom shelves, slow moving parts on the top, and fast moving parts on the shelves that are easiest to reach.

Job Sheet 1

Evaluator's comments: ______________________________

____

____

Stocking, Shipping, and Receiving
Unit 10

Job Sheet 2—Check In and Stock Parts

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Stock was checked in properly and stocked properly	______
Directions were followed	______

A. Introduction: Orderly stocking of parts as they are received is an absolutely necessary part of efficient stock management.

B. Equipment and Materials

- Large cardboard box or boxes
- Assorted parts packed within the box
- Packing slip
- Tags to number or label parts
- Parts bins

C. Procedure

☐ 1. Locate packing slip in box.

☐ 2. Open each part in box; be certain to observe each part number to make certain it corresponds with the number on the packing slip and check them off.

☐ 3. Tag each part according to which bin and shelf it is to be placed on.

☐ 4. If there are any shortages or damaged parts, make note of them on the packing slip.

☐ 5. Stock parts in appropriate bins.

Evaluator's comments: ______________________________

____

____

Stocking, Shipping, and Receiving
Unit 10

Job Sheet 3—Fill and Pack an Order

Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Stock was packed and paperwork was completed properly	______
Directions followed	______

A. Introduction: Filling a carefully packed order properly with adequate paperwork to ensure its efficient delivery is essential to continued business in the parts business.

B. Equipment and Materials

- Order or checklist of parts to be packed
- Parts bins with merchandise on shelves
- Box to pack order in
- Packing material
- Tape and string to wrap box
- Label for addressing box
- Packing slip and invoice

C. Procedure

☐ 1. Have checklist in hand.

☐ 2. Pull needed parts from bins.

☐ 3. Check off parts as they are pulled.

☐ 4. Pack neatly in box, using packing material if necessary.

☐ 5. Enclose the packing slip when all parts to be shipped are in the box.

☐ 6. Prepare invoice (include quantity, description, and price of each part shipped along with the total cost of merchandise).

Note: Some orders may be sent without prices; only a packing slip is sent and the invoice is sent later.

☐ 7. Prepare the box for shipment.

Job Sheet 3

Evaluator's comments: ____

____

____

Inventory Control
Unit 11

Objective Sheet

Unit Objective

After completing this unit, the student should be able to fill out inventory cards and take a physical inventory. The student should demonstrate these competencies by completing the assignment sheet and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to inventory control with their correct definitions.
2. List needs fulfilled by good inventory control.
3. Select true statements concerning purposes for taking inventory.
4. Match items included on inventory cards with their purposes.
5. Select true statements concerning guidelines for taking a physical inventory.
6. Select true statements concerning perpetual and physical inventories.
7. List advantages of computers in inventory control.
8. Complete the national coding system for popularity of parts.
9. Complete statements concerning regional coding systems for popularity of parts.
10. Fill out an inventory control card. (Assignment Sheet 1)
11. Take a physical inventory. (Job Sheet 1)

Inventory Control
Unit 11

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Also note suggested resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain films, videotapes, and other media to supplement instruction of this unit.

- Make transparencies from the transparency masters included in this unit.

- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.

- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Teaching Suggestions

Objective 1 Match terms related to inventory control with their correct definitions.

Suggested Activities

- Read and discuss with the class the various terms and definitions cited here. Try to give examples of each to enhance comprehension. **(Listening for content)**

- Arrange for a local parts store manager to visit the class to discuss inventory control. (Or cover this topic during a field trip to a local parts store.) Assign the class members a written report on the visit and what they learned. **(Listening for content; applying technical terms; communicating a thought or idea in written form)**

Objective 2 List needs fulfilled by good inventory control. **Objective 3** Select true statements concerning purposes for taking inventory.

- Lead the class in a discussion of what can happen if inventory control procedures are not followed. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation; orally communicating a thought)**

Objective 4 Match items included on inventory cards with their purposes.

- Using Transparency Masters 1 and 2 and Student Supplement 1, "Computer Printout for Inventory Control," lead the class in a discussion of what information is needed to maintain adequate inventory control. **(Listening/reading for content; orally communicating a thought)**

- Discuss how information manually written on an inventory card is the same information keyed into a computer system. **(Listening for content)**

- Hand out Assignment Sheet 1, "Fill Out an Inventory Control Card." Discuss introduction, directions, and evaluation criteria with students. Answer any questions, then have students complete activity. **(Listening for content and directions)**

Objective 5 Select true statements concerning guidelines for taking a physical inventory.

- Read and discuss items in Objective 5 and information received during visit to parts store or parts store manager visit. **Listening/reading for content; adapting to the organization's traditional modes of operation)**

Suggested Activities

- Role play telephone conversations with lists of parts numbers using 5s, 7s, 8s, and 9s. Have students copy a list of parts numbers, then shuffle the written copies to other students and "telephone" those numbers to the instructor or other students to determine the accuracy of penmanship and verbal communication. **(Adapting to the organization's traditional modes of operation; writing; orally communicating a thought)**

- Hand out Job Sheet 1, "Take a Physical Inventory." Demonstrate proper techniques following the steps in the job sheet. Answer any questions, then have students complete Job Sheet 1. **(Listening for content and directions)**

Objective 6 Select true statements concerning perpetual and physical inventories.

- Read and discuss the information in this objective. **(Reading/listening for content)**

Objective 7 List advantages of computers in inventory control.

- Discuss with students the ways computers make inventory control more accurate and efficient. **(Listening for content; orally communicating a thought)**

- During visit of parts store manager or visit to parts store, investigate the use of the computer and ask for a comparison of inventory control chores before and after computer. Assign students to write a short report on the results. **(Listening for content; communicating a written thought)**

Objective 8 Complete the national coding system for popularity of parts. **Objective 9** Complete statements concerning regional coding systems for popularity of parts.

- Read and discuss the information in Objectives 8 and 9, and compare these systems with systems being used by parts stores in your area. Ask students to discuss in class why such a system would be needed. **(Listening for content; reasoning; orally communicating a thought)**

Evaluation

- Evaluate assignment sheet. See the evaluation criteria listed at the top of the assignment sheet and the component "Answers to Assignment Sheet 1."

Suggested Activities

- Evaluate job sheet. See the evaluation criteria listed at the top of the job sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job-sheet scores on the "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Automotive Wholesaler Counterman's Handbook*. Chicago, IL: Automotive Service Industry Association.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management. Albany, NY: Delmar Publishers Inc., 1989.*
- Sumpter, Tom. *Basic Auto Parts Training*. Fairview, OR.

Supplemental Resources

- A number of training resources are available from the NAPA (National Auto Parts Association) stores and their regional warehouses. Find a NAPA dealer through local Yellow Page listings, or contact: NAPA VideoSource (Helm, Inc.), P.O. Box 5450/Dept. N, Detroit, MI 48202-9953.

Suggested Activities

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.
- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Inventory Control
Unit 11

Answers to Assignment Sheet 1

No. 736234			MAX. 6	MIN. 2	
APPLICATION Muffler	CLASS B	DEPT.	SET	UNIT PKG.	COST 28.58

SALES 19 FIRST QTR.				SALES 2ND QTR.				SALES 3RD QTR.		SALES 4TH QTR.	
DATE	RECD.	SOLD	BAL.	DATE	RECD.	SOLD	BAL.	DATE	RECD.	SOLD	BAL.
7/12	4		4								
8/6		2	2								
8/8	4		6								
8/15		3	3								

NO 736234

Inventory Control
Unit 11

Answers to Written Test

1.	a.	7	f.	10	k.	19	p.	16
	b.	9	g.	1	l.	14	q.	12
	c.	8	h.	6	m.	18	r.	13
	d.	5	i.	2	n.	20	s.	11
	e.	3	j.	4	o.	15	t.	17

2. a. Keeps supplies and parts up to date
   b. Keeps track of damaged stock
   c. Controls improperly binned stock
   d. Keeps customer satisfaction up
   e. Controls understocking or overstocking
   f. Shows movement and turnover of stock

3. a, c, d, f, g, i

4.	a.	5	e.	13	h.	9	k.	12
	b.	11	f.	2	i.	10	l.	6
	c.	7	g.	3	j.	4	m.	8
	d.	1						

5. a, b, c, d, h

6. a, c, d

7. Any six of the following:

   a. Quickly produces an order printout for daily or weekly purchases from a supplier
   b. Produces a clearly printed invoice for the customer
   c. Automatically removes items sold from inventory
   d. Saves time in the posting of items on inventory cards
   e. Can be programmed to set minimums and maximums
   f. Checks stock and identifies superseded items
   g. An "on line" computer can order merchandise automatically
   h. Can check supplier's stock automatically
   i. Can check backorder items

8. b. Medium moving parts
   c. Average moving parts
   d. Slow moving parts
   e. Warehouse stock
   f. New item
   g. Increasing popularity
   h. Decreasing popularity

9. a. Slow moving
   b. Average moving

Inventory Control
Unit 11

Written Test

Name ______________________________ Score ______________

1. Match terms related to inventory control with their correct definitions. Write the numbers on the blanks provided below. Definitions continue on next page.

______a. Parts and supplies on hand for sale to customers

______b. Methods of keeping record of the quantity and type of merchandise on hand

______c. Used to keep a running count of items in inventory

______d. Sometimes called hard lines which include metal parts, power tools, hand tools, paints, electrical products, and various hardware items kept by the parts suppliers

______e. A type of perpetual inventory whereby the first items placed in stock are the first ones taken out

______f. A type of perpetual inventory whereby the newest items placed in stock are the first ones taken out

______g. Merchandise that sells quickly

______h. An order placed after a regular stock order to replenish stock until the regular stock order shipment is received

______i. An order placed for special items not regularly stocked

______j. Methods using small tags attached to inventory control cards to indicate at a glance whether a part is backordered or out of stock

1. Active stock
2. Emergency order
3. FIFO
4. Flag
5. Hard parts
6. Intermediate order
7. Inventory
8. Inventory card
9. Inventory control
10. LIFO

Written Test

______k. A method of placing new merchandise behind older merchandise so old items will be sold first

______l. Record kept of each item showing the amount of merchandise put in stock, withdrawn, and on hand at any given time without the necessity of taking a physical count

______m. Usually nonmetal items such as rubber, paper, gaskets, hoses, belts, and other pliable goods

______n. How quickly stock moves and is replaced within a certain period of time

______o. A method used to count items in stock by hand, usually taken at least once a year

______p. Adding to or removing an item or items recorded on inventory cards

______q. A method used in inventory control to maintain a minimum or maximum number of any specific items in stock

______r. Visual display screen used with a computer

______s. Items requested by customers but not carried in stock

______t. Merchandise kept in warehouse to replace active stock as it is sold

11. Lost sales
12. Mini/max
13. Monitor
14. Perpetual inventory
15. Physical inventory
16. Posting
17. Reserve stock
18. Soft parts
19. Stock rotation
20. Turnover

Written Test

2. List needs fulfilled by good inventory control.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

e. ______________________________

f. ______________________________

3. Select true statements concerning purposes for taking inventory by placing an "X" in the appropriate blanks.

_______a. Helps update stock

_______b. Tabulates sales of each employee

_______c. It shows whether or not all stock is accounted for

_______d. Helps in preparing financial statements for tax purposes or special reports

_______e. Promotes sales production and increases benefits for group insurance

_______f. Helps in preparing lost sales report

_______g. Checks the actual condition of stock

_______h. Decreases the cost of the wholesale price

_______i. It reveals items replaced or superseded

Written Test

4. Match items included on inventory cards on the right with their purposes. Write the numbers on the blanks provided below.

______a. A number assigned to a specific part; sometimes accompanied by a letter for added ease of locating parts

______b. Minimum and maximum number of parts kept in stock

______c. Common name of the part

______d. Popularity code assigned to an item

______e. Department carrying the item in stock

______f. Priced and sold as a set

______g. Items that can be priced and sold individually

______h. Price of each piece of unit pkg or price of set

______i. Record of number sold quarterly

______j. Date parts are sold, received, or inventoried

______k. Number of items received

______l. Number of items sold

______m. Number of items in current inventory

1. Class
2. Set
3. Unit pkg
4. Date
5. Part No.
6. Sold
7. Application
8. Bal
9. Cost
10. Sales
11. Mini/Max
12. Recd
13. Dept

5. Select true statements concerning guidelines for taking a physical inventory by placing an "X" in the appropriate blanks.

______a. Merchandise should be arranged by shelf or section, or the order in which the merchandise will be recorded on the inventory sheet.

______b. When filling out the description column use a wavy line to indicate the item is the same as the item on the previous line; do not use ditto (") marks on this column.

______c. Do not erase; cross out, using a pen or pencil for corrections.

Written Test

_______d. Write legibly because someone must read what you have written.

_______e. Leave spaces blank as needed.

_______f. Leave lines blank as needed.

_______g. Count merchandise from the bottom shelf first moving from left to right then up.

_______h. Quantities of an item should be listed per item with the price entered per item, and then extended and added to the total.

6. Select true statements concerning perpetual and physical inventories by placing an "X" in the appropriate blanks.

_______a. When a physical inventory is taken, results are compared to the perpetual inventory to see if they equal each other.

_______b. There is no need for the perpetual inventory when the physical inventory shows the overhead is higher than the gross profit for any given period.

_______c. When the results are the same, the physical inventory is even.

_______d. When the physical inventory is less than the perpetual inventory, the physical inventory is short.

_______e. When the physical inventory is more than the perpetual inventory, the physical inventory is short.

7. List six advantages of computers in inventory control.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

Written Test

8. Complete the national coding system for popularity of parts.

   a. A = Fast moving parts

   b. B = ______________________________

   c. C = ______________________________

   d. D = ______________________________

   e. W = ______________________________

   f. N = ______________________________

   g. ↑ = ______________________________

   h. ↓ = ______________________________

9. Complete statements concerning regional coding systems for popularity of parts by circling the words that best complete each statement.

   a. When the letter A is used in a regional coding system, it means the part is (slow moving) (fast moving).

   b. When the number 3 is used in a regional coding system, it means the part is (medium moving) (average moving).

*Permission to duplicate this test is granted.

Inventory Control
Unit 11

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Fill Out an Inventory Control Card Rating ______

Comments: ____

____

Job Sheet 1—Take a Physical Inventory Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________________ Date __________

Student Signature ______________________________ Date __________

*Permission to duplicate this form is granted.

Inventory Control Card

No. 38438	MAX 10	MIN 4

APPLICATION	CLASS	DEPT	SET	UNIT PKG	COST
Starter	A				38.43

SALES 1994 FIRST QTR		SALES 2ND QTR				SALES 3RD QTR				SALES 4TH QTR	
DATE	RECD	SOLD	BAL	DATE	RECD	SOLD	BAL	DATE	RECD	SOLD	BAL
10/23	8		8								
10/26		2	6								
11/11		1	5								
11/15		2	3								
11/25	9		12								
12/2		1	11								
12/10		4	7								
12/19		2	5								
12/20	6		11								
1/2		1	10								
1/12		3	7								
1/29		2	5								

NO 38438

The number at the bottom of the card indicates that the card can be turned upside down when a minimum number of the item is in stock; when the item is backordered, a metal flag can be attached to the top of the card; this particular inventory control card indicates that the fiscal year probably begins in October.

755

Computer Printout for Inventory Control

```
BELOW ORDER POINT REPORT FOR MAIN AUTOMOTIVE SUPPLY INC                            11 18 94                       CODES 1          PAGE 1
                          S            CORE     PRICE                     NEW   ON    B            B   ORD   ST                          * S A L E S *          EST    BUY
LINE   PART NUMBER        #    COD     COST       C        EXTENSION      ORD   ORD   O    QOH     O   PNT   PK   WT  DESCRIPTION     TD  CURR  LPD  YTD  LY  TR  SLS    OUT
                                                                                                                                                         R
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------
ACP                       A    * 1  FUEL PUMP              VENDOR  NAP

       95 41040           A    D 1                11 81          11 81     1                 0          1     1                        1    1   0000    1   4
       95 41302           A    B 1                14 88          14 88     1                 0          1     1        1179G           1    1      1    2   4
       95 41353           A    C 1                13 95          27 90     2                 1          2     2        F41255 580      4    8      4   21  10

ALC                       A    * 1  CHASSIS                VENDOR  NAP

       260 1106           A    D 1                14 40          14 40     1                 0          1     1   2C   1179G           1    1  00000    1   5
       268 1560           A    D 1                16 73          16 73     1                 0          1     1        18755           1    2      2    7   1
       269 2303           A    D 1                10 20          20 40     2                 0          2     1   2C                   2    2      5   12   7
```

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Inventory Control
Unit 11

Information Sheet

1. **Terms and definitions related to inventory control**

   a. **Active stock** — Merchandise that sells quickly

   b. **Emergency order** — An order placed for special items not regularly stocked

   c. **FIFO** (first in, first out) — A type of perpetual inventory whereby the first items placed in stock are the first ones taken out

   Note: This is the most common method used to keep stock fresh.

   d. **Flag** — Methods using small tags attached to inventory control cards to indicate at a glance whether a part is backordered or out of stock

   Note: Because of increasing use of computerized inventory control systems, this method rapidly is becoming obsolete

   e. **Hard parts** — Sometimes called hard lines which include metal parts, power tools, hand tools, paints, electrical products, and various hardware items kept by the parts suppliers

   f. **Intermediate order** — An order placed after a regular stock order to replenish stock until the regular stock order shipment is received

   g. **Inventory** — Parts and supplies on hand for sale to customers

   h. **Inventory card** — Used to keep a running count of items in inventory

   Note: Because of increasing use of computerized inventory control systems, this method rapidly is becoming obsolete

   i. **Inventory control** — Methods of keeping record of the quantity and type of merchandise on hand

   j. **LIFO** (last in, first out) — A type of perpetual inventory whereby the newest items placed in stock are the first ones taken out

Information Sheet

k. **Lost sales** — Items requested by customers but not carried in stock

Note: This usually does not include special order items. It does over time, however, track requests for parts that are not normally stocked by the store. For instance, in the late 1980s General Motors made certain changes in placement of oil filters on some of its 4-cylinder 2.5 liter engines used in Chevrolet Celebrities and Pontiac 6000 models. The change placed the oil filter inside the engine, covered by a saucer-sized plug made of soft metal. Because the plug required a metric wrench, many were burred and destroyed by mechanics using SAE wrenches and the demand for these plugs skyrocketed. Auto parts stores did not stock this plug and had to refer customers to GM dealers. Over time, these "lost sales" generated enough demand that after-market manufacturers began producing the plug and today, you can purchase the part in most major parts stores.

l. **Mini/max** — A method used in inventory control to maintain a minimum or maximum number of any specific items in stock

Note: Parts are ordered when the minimum quantity is reached, not to exceed the maximum number; the mini-max numbers may have to be raised or lowered depending on the rate of turnover.

m. **Monitor** — Video display screen used with a computer

Note: This is also referred to as a VDT (video display terminal).

n. **Perpetual inventory** — Record kept of each item showing the amount of merchandise put in stock, withdrawn, and on hand at any given time without the necessity of taking a physical count

o. **Physical inventory** — A method used to count items in stock by hand, usually taken at least once a year

p. **Posting** — Adding to or removing an item or items recorded on inventory cards

q. **Reserve stock** — Merchandise kept in warehouse to replace active stock as it is sold

r. **Soft parts** — Usually nonmetal items such as rubber, paper, gaskets, hoses, belts, and other pliable goods

s. **Stock rotation** — A method of placing new merchandise behind older merchandise so old items will be sold first

Note: Refer to FIFO.

t. **Turnover** — How quickly stock moves and is replaced within a certain period of time

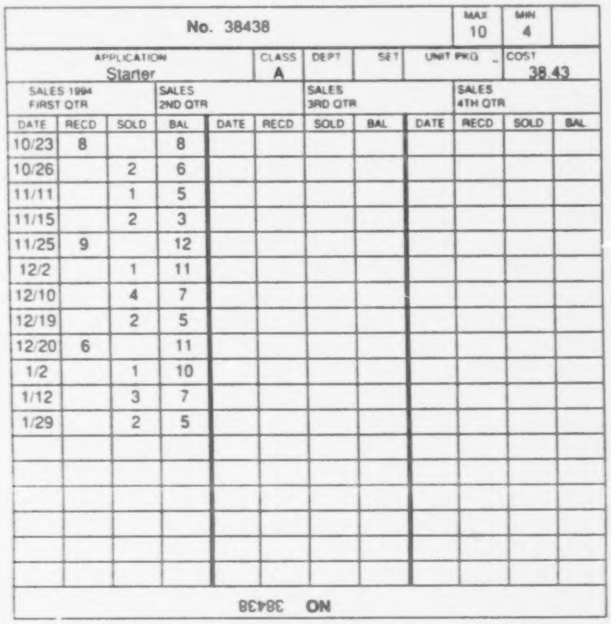
Information Sheet

2. **Needs fulfilled by good inventory control**
    a. Keeps supplies and parts up to date
    b. Keeps track of damaged stock
    c. Controls improperly binned stock
    d. Keeps customer satisfaction up
    e. Controls understocking or overstocking
    f. Tracks movement and turnover of stock
3. **Purposes for taking inventory**
    a. Shows whether all stock is accounted for
    b. Helps in preparing financial statements
    c. Helps in preparing lost sales report
    d. Checks actual condition of stock
    e. Reveals items replaced or superseded
    f. Can help to update stock

Information Sheet

4. Items included on inventory cards and their purposes

Note: Although computers are rapidly replacing the card system, the information found on the inventory cards is the same as is entered in the computer. These cards can be a separate file, or copies of sales tickets completed at the time of the sale and filed for daily computation of inventory.



No. 38438				MAX 10	MIN 4	
APPLICATION Starter	CLASS A	DEPT	SET	UNIT PKG	COST 38.43	

SALES 1994 FIRST QTR				SALES 2ND QTR				SALES 3RD QTR				SALES 4TH QTR			
DATE	RECD	SOLD	BAL	DATE	RECD	SOLD	BAL	DATE	RECD	SOLD	BAL	DATE	RECD	SOLD	BAL
10/23	8		8												
10/26		2	6												
11/11		1	5												
11/15		2	3												
11/25	9		12												
12/2		1	11												
12/10		4	7												
12/19		2	5												
12/20	6		11												
1/2		1	10												
1/12		3	7												
1/29		2	5												

NO 38438

a. Part no. — A number assigned to a specific part; sometimes accompanied by a letter for added ease of locating parts

b. Mini/max — Minimum and maximum number of parts kept in stock

c. Application — Common name of part

Note: Application may include a description or descriptive items such as weight or technical clarification.

d. Class — Popularity code assigned to an item

e. Department (Dept) — Department carrying the item in stock

f. Set — Priced and sold as a set

Example: Disc brake pads, brake shoes

Information Sheet

g. Unit pkg (package) — Items that can be priced and sold individually

Example: Spark plugs

h. Cost — Price of each piece of unit pkg or price of set

i. Sales — Record of number sold quarterly

Note: On computerized systems, sales may be totaled daily.

j. Date — Date parts are sold, received, or inventoried

k. Recd (Received) — Number of items received

l. Sold — Number of items sold

m. Bal (Balance) — Number of items in current inventory

5. **Guidelines for taking a physical inventory**

a. Merchandise should be arranged by shelf or section, or the order in which the merchandise will be recorded on the inventory sheet.

b. When filling out the description column, use a wavy line to indicate the item as the same as the item on the previous line; do not use ditto (") marks on this column.

c. Do not erase; cross out, using a pen or pencil for corrections.

d. Write legibly because someone must read what you have written.

Note: Write dollars and cents accurately, making certain to keep the dollar amount in the dollar column and the cents in their column. Also write numbers such as 1, 4, 5, 7, 8, 9 as these numbers can be confused with one another.

e. Do not leave spaces blank in any of the columns when recording stock items.

f. Do not leave any lines blank.

g. Count merchandise from the top shelf first moving from left to right then down.

h. Quantities of an item should be listed per item with the price entered per item, and then extended and added to the total.

Information Sheet

6. Perpetual and physical inventories

a. When a physical inventory is taken, results are compared with the perpetual inventory to see if they equal one another.

b. When the results are the same, the physical inventory is even.

c. When the physical inventory is less than the perpetual inventory, the physical inventory is short.

d. When the physical inventory is more than the perpetual inventory, the physical inventory is over.

Note: When the physical inventory is short or over, it indicates a problem and corrections should be made on balance card.

7. Advantages of computers in inventory control

Note: Nearly all parts outlets are moving to computerized inventory control. In the early 1990s, more than 60 percent of all jobbers were computerized. For more information about computers in inventory control, refer to Student Supplement 1.

a. Quickly produces an order printout for daily or weekly purchases from a supplier

b. Produces a clearly printed invoice for the customer

c. Automatically removes items sold from inventory

d. Saves time in posting items on inventory cards

e. Can be programmed to set minimums and maximums

f. Checks stock and identifies superseded items

g. An "on line" computer can order merchandise automatically

h. Can check suppliers stock automatically

i. Can check backorder items

Note: The computer helps in many other areas of business operations, but is only as accurate as the person operating it. Computers only store and retrieve information. They cannot determine what parts a store should stock, they cannot unpack new stock and check packing slips, they cannot note errors in the amount of merchandise received, and they cannot stock shelves. Therefore, their advantages are limited to information retrieval only, and those advantages are limited by the accuracy of the information input by the operator.

Information Sheet

8. **National coding system for popularity of parts**

   a. A = Fast moving parts

   b. B = Medium moving parts

   c. C = Average moving parts

   d. D = Slow moving parts

   e. W = Warehouse stock

   f. N = New item

   g. ↑ = Increasing popularity

   h. ↓ = Decreasing popularity

9. **Regional coding systems for popularity of parts**

   a. Letter type coding

      1. A = Slow moving parts

      2. B = Average moving parts

      3. C = Medium moving parts

      4. D = Fast moving parts

   b. Number type coding

      1. 1 = Fast moving parts

      2. 2 = Medium moving parts

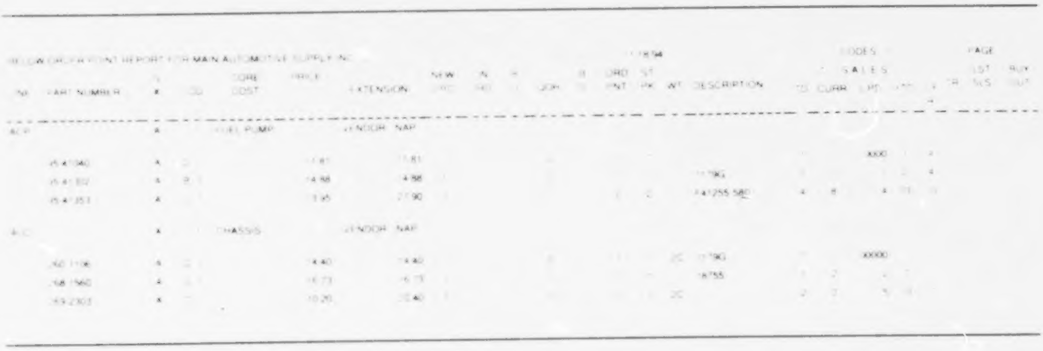
      3. 3 = Average moving parts

      4. 4 = Slow moving parts

   Note: Codes may vary from region to region, and students should become familiar with the coding system used in the region where they plan to work.

Inventory Control
Unit 11

Student Supplement 1—Computer Printout for Inventory Control



Computerized inventory systems serve functions ranging from posting to billing. The example above is a BELOW-ORDER-POINT REPORT and should be read left to right as follows: The ACP is the three-digit manufacturer code and means AC Fuel Pumps, the part number follows, and S# means store number, and the A underneath indicates there is more than one store in the chain.

COD is a three-digit control number whose first digit indicates popularity of the item, the second digit is a control number for adding, dropping, or for seasonal items, and the third digit lists the supplier.

PRICE C is price per unit and EXTENSION is the price per unit times the number of units ordered. NEW ORD means new order. ON ORD means on order. BO means back order, QOH means quantity on hand, and ORD POINT means the quantity on hand has reached a minimum number and a new order is placed automatically. ST PK means the standard order quantity.

WT means weight and is used to indicate multiple-package items or weight requirements for the supplier to pay freight. DESCRIPTION may simply describe the item or be programmed for such functions as writing a customer invoice, or taking an item off inventory and placing it in accounts receivable.

All items under SALES have the following meanings: TD is current month, CURR is current quarter, L/PD is previous quarter, YTD is year to date, and L/YR is last year. TR is the total of lost sales and buy outs, LST SLS indicates lost sales, and BUY OUT indicates items bought at other stores to service a good customer who wants an item that is out of stock or back ordered.

Big volume auto parts stores order daily; computers ease the burden of ordering, inventory, bookkeeping, but counterpersons must understand the printouts and their purposes and supply the system with information that reflects changing customer demands.

PS-401

Inventory Control
Unit 11

Assignment Sheet 1—Fill Out an Inventory Control Card

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Entries are legible	______
Answers are correct	______

Introduction: In Objective 4 you studied inventory control cards and their application. This exercise will help you become familiar with the inventory control system and allow you to apply what you have learned. Even if you never use a physical paper inventory control card, the information you input into computers on the job will be the same as required in this exercise.

Directions: Using the following information, fill out the inventory card below. The part number of a muffler is 736234, which costs $28.58 individually. The minimum stock order point is 2 and the maximum stock order point is 6. The muffler has a popularity class code of B. The beginning inventory is 4 and they arrived on 8/12/94. On 9/6/94, two (2) mufflers were sold and that same day four (4) mufflers were ordered. Two days later the mufflers arrived. On 9/15/94, three (3) mufflers were sold. How many mufflers would be in stock if a physical inventory were taken on 9/16/94? ______

No.									MAX.	MIN.	
APPLICATION					CLASS	DEPT.	SET	UNIT PKG.		COST	
SALES 19 FIRST QTR.			SALES 2ND QTR.			SALES 3RD QTR.			SALES 4TH QTR.		
DATE	RECD.	SOLD	BAL.	DATE	RECD.	SOLD	BAL.	DATE	RECD.	SOLD	BAL.
ON											

Inventory Control
Unit 11

Job Sheet 1—Take a Physical Inventory

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Boxes opened neatly for easy counting	______
Parts identified and tagged	______
Inventory sheet properly completed	______
Moved to the right and down in inventory process	______

A. Introduction: As you learned in Objective 5, there are standard methods by which one takes a physical inventory to assure accuracy and complete records. This exercise allows you to demonstrate your skills in this area.

B. Equipment and Materials

- Inventory sheet
- Pencil
- Bins stocked with parts
- Clipboard

C. Procedure

Prepare for inventory.

☐ 1. Pick a partner.

☐ 2. Clean bins.

☐ 3. Open boxes neatly and orderly for easy counting.

☐ 4. Identify and tag miscellaneous parts.

Count and record inventory.

☐ 1. Fill out heading on inventory sheet.

☐ 2. Have caller start at top, far left, corner of bin.

Job Sheet 1

☐ 3. Move to the right and down recording every item on the shelves.

☐ 4. Price and extend costs as you go.

☐ 5. Total inventory sheets.

☐ 6. After completing these steps, hand your inventory sheet to your instructor for evaluation.

Evaluator's comments: ____

____

____

PS-405

Job Sheet 1

Inventory ______________________ Page ____________

Sheet No. ______________________ Priced By ____________

Called By ____________ Department ____________ Extended By ____________

Entered By ____________ Location ____________ Examined By ____________

QUANTITY	UNIT	DESCRIPTION	PRICE	UNIT	EXTENSION	TOTAL	✓

Cataloging and Pricing
Unit 12

Objective Sheet

Unit Objective

After completing this unit, the student should be able to use both published and computer catalog systems and set up a catalog indexing system. The student should demonstrate these competencies by completing the assignment sheets and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to cataloging and pricing with their correct definitions.
2. Select from a list the four major catalog indexing systems.
3. Select types of information found in catalogs.
4. Arrange in order the basic steps for looking up a part in a published catalog.
5. Arrange in order the basic steps for looking up a part in a computer catalog.
6. Select true statements concerning how to price parts correctly.
7. Write a brief description of the microfiche system and how to use it.
8. Use an engine parts catalog. (Assignment Sheet 1)
9. Use a master gasket catalog. (Assignment Sheet 2)
10. Use a brake parts catalog. (Assignment Sheet 3)
11. Use an exhaust system catalog. (Assignment Sheet 4)
12. Use a chassis parts catalog. (Assignment Sheet 5)
13. Use a computer parts catalog. (Assignment Sheet 6)
14. Set up a catalog indexing system. (Job Sheet 1)

Cataloging and Pricing
Unit 12

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.
- Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Obtain automotive and small engine parts lists, catalogs, price sheets, films, videotapes, and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Select teacher components (written test, teacher supplements, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Teaching Suggestions

Objective 1 Match terms related to cataloging and pricing with their correct definitions.

Suggested Activities

- Read and discuss with the class the various terms and definitions cited here. Try to give examples of each to enhance comprehension. Discuss reasons for various prices within the parts industry. **(Reading/listening for content; orally communicating a thought or idea)**

- Arrange for a local parts store manager to visit the class to discuss catalog use. (Or, cover this topic during a field trip to a local parts store.) Assign the class members a written report on the visit and what they learned. **(Listening for content; applying technical terms; communicating a thought or idea in written form)**

- Use Teacher Supplement 1, "Catalog vs. Computer," as the basis for class discussion comparing print catalogs to computer systems. Present information provided in supplement, then ask students what they see as the advantages/disadvantages of each. **(Listening for content; orally communicating a thought or idea; critical thinking)**

Objective 2 Select from a list the four major catalog indexing systems.

- Use Transparencies 1 and 2 to introduce major systems.

- Provide examples of each system for class to examine. Lead a discussion on the advantages and disadvantages of each. **(Listening for content; orally communicating a thought)**

- Assign class members to teams and have them visit different parts stores to inquire how catalogs are arranged, and how parts specialists are trained to use them. Have teams select a spokesperson to relate their findings to the class. **(Listening for content; applying technical terms; orally communicating a thought or idea; teamwork)**

- Hand out Job Sheet 1, "Set Up a Catalog Indexing System." Read and discuss procedure and evaluation criteria. Answer any questions, then have students complete job sheet. **(Listening for content; applying technical terms)**

Objective 3 Select types of information found in catalogs.
Objective 4 Arrange in order the basic steps for looking up a part in a published catalog.

Suggested Activities

- Hand out various parts catalogs to students and let them find examples of the various types of information found in catalogs. Have them read section on how to use the catalog. **(Reading for content; learning to learn)**

- Prepare lists of parts needed for a number of different vehicles covered in your sample catalog and assign class members to role play the parts specialist who must locate the correct parts for a customer. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation; orally communicating a thought)**

- Point out to students that in addition to parts numbers, prices, and descriptions, most catalogs will include footnoted information to more precisely list parts for specific applications. Explain that the information addresses such things as mid-year model changes, obsolete parts numbers, duplicate parts numbers, etc. Give examples of footnotes and show how they are used. **(Listening for content)**

- Based on catalog availability in class, create situations where students have to rely on footnotes in catalogs to determine correct part numbers for various items. Then have students discuss how footnotes can help parts specialists locate parts numbers in catalogs. **(Reading/listening for content; orally communicating a thought; reasoning; applying technical terms)**

Objective 5 Arrange in order the basic steps for looking up a part in a computer catalog.

- Explain to the class that material is stored on a computer much the same way as a published catalog series is arranged: by year, make, model, subsystems, and application. Emphasize the importance of obtaining the correct information from the customer to enable an efficient parts search using the computer. **(Listening for content)**

- Using information in Objective 5 and examples provided by local parts stores, lead the class through the "question-and-answer" method of selecting various prompts on a computer screen to locate a specific part. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation; orally communicating a thought)**

Suggested Activities

Objective 6 Select true statements concerning how to price parts correctly.

- Arrange for a parts store manager to visit with the class about the different prices used in the modern parts store and why they exist. Emphasize the importance of a parts specialist's knowledge of company policy on prices. **(Listening for content; adapting to the organization's traditional modes of operation)**

- Discuss the importance of keeping price information confidential. **(Listening for content; adapting to the organization's traditional modes of operation)**

- Using available parts catalogs and price lists, have students look up prices for their classmates who have been assigned various roles, i.e. dealer, jobber, walk-in customer, mechanic, etc. **(Listening for content; applying technical terms; orally communicating a thought or idea)**

Objective 7 Write a brief description of the microfiche system and how to use it.

- Arrange for the class to see a microfiche reader in action. Allow members to look at the microfilm card on which thousands of items are cataloged in tiny microimages.

- Explain how the microfilm cards are cataloged (by year, make, model, etc.) and relate that information to a rack of published and bound catalogs. **(Listening for content; applying technical terms)**

- Have students complete Assignment Sheets 1 through 6 to provide them with opportunities to use various types of parts catalogs. Read and discuss directions and evaluation criteria with students. Answer any questions, then have them complete and turn in assignments for evaluation. **(Reading/listening for content; learning to learn; applying technical terms)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."

- Evaluate job sheet. See the evaluation criteria listed at the top of the job sheet.

Suggested Activities

- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job-sheet scores on the Unit Evaluation Form.
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Automotive Wholesaler Counterman's Handbook*. Chicago, IL: Automotive Service Industry Association.
- *Brake Catalog, Passenger Car Light Truck*, 17A-100-2, Vol. 2. Detroit, MI: AC-Delco.
- *EVERCO*, Catalog No. HA-81. Lincolnwood, IL.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management*. Albany, NY: Delmar Publishers Inc., 1989.
- *MOOG Chassis Parts*, Vol. 2. St. Louis, MO: Moog Automotive, Inc.
- *NAPA Belts/Hose Catalog*, Catalog No. 474-2081A. Denver, CO.
- Notgrass, Troy. *Auto Parts Counter Worker*. Austin, TX: Instructional Materials Center, University of Texas.
- *Quick Reference Parts Manual*, Form No. 694950. Grafton, WI: Tecumseh Products Co. 1988.
- Sumpter, Tom. *Basic Auto Parts Training*. Fairview, OR.
- *Victor Oil Seal Catalog*, Form No. MO-310-79. Toledo, OH.
- *Wagner Hydraulic Brake Parts for Medium and Heavy Duty Trucks*, Catalog HU-801. Parsippany, NY.
- *World Parts, Auto Parts for Imports*, Catalog. Nashville, TN.

Suggested Activities

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.
- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Cataloging and Pricing
Unit 12

Answers to Assignment Sheets

Assignment Sheet 1

Note: Answers for section B should be evaluated using parts catalog provided by the instructor.

C.
1. Chevrolet
2. Plymouth
3. Geo
4. Nissan
5. Dodge
6. Oldsmobile
7. Pontiac
8. Ford
9. Ford
10. Dodge

Assignment Sheet 2 — All items should be evaluated using parts catalog provided by the instructor.

Assignment Sheet 3

Note: Answers for section D should be evaluated using parts catalog provided by the instructor.

C.
1. Adjusting or adjuster
2. Brakes
3. Disk brakes
4. Diameter
5. Master cylinder
6. Outside diameter
7. Power brakes
8. Standard
9. Secondary
10. Without

Answers to Assignment Sheets

Assignment Sheet 4

Note: Answers for sections C, E, and F should be evaluated using parts catalog provided by the instructor.

D.
1. Bbl.
2. Brkt.
3. Calif.
4. Clmp.
5. Cpe.
6. Exc.
7. Exh.
8. Flng.
9. H.D.
10. Hngr.
11. I.D.
12. L.H.
13. N.A.
14. N.R.
15. R.H.
16. W/
17. Wo/

Assignment Sheet 5 — All items should be evaluated using parts catalog provided by the instructor.

Assignment Sheet 6

A.
1. W60-416
2. W60-420

B.
1. W60-234
2. Discontinued

C.
1. W62-531
2. W67-552

D.
1. McPherson strut cartridge

E.
1. No
2. Station wagon uses W60-136

Assignment Sheet 7

A.
1. 08
2. 91
3. 8
4. (left blank or "No")

B.
1. 05
2. 90
3. 5
4. X or "Yes"

C.
1. 20
2. 5

D.
1. 13
2. 6

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Cataloging and Pricing
Unit 12

Answers to Written Test

1.

a.	1	d.	2	g.	7
b.	4	e.	5	h.	6
c.	3	f.	8		

2. a, c, e, f

3. a, c, e, f, h, i

4.

a.	7	d.	3	g.	6
b.	4	e.	8	h.	5
c.	1	f.	2		

5.

a.	3	d.	4
b.	1	e.	6
c.	2	f.	5

6. a, c, d, e, f, h, j

7. Answer may be in student's own words but should include the following:

   a. Catalog pages are reduced into rows of microimages on microfilm (up to 1,000 pages on one microfilm card).
   b. Microfiche reader is used to magnify small images for ease of reading.
   c. Microfiche cards are labeled according to year, make, model of vehicle, or small engine.
   d. When a customer gives you the necessary information to look up a part, you simply locate the corresponding card and place it in the reader.
   e. Find appropriate grouping and page for part needed.
   f. Choose correct part number.

Cataloging and Pricing
Unit 12

Written Test

Name ______________________________ Score ______________

1. Match terms related to cataloging and pricing with their correct definitions. Write the numbers on the blanks provided below.

______a. Price charged to other dealers within the system or industry who are authorized to sell to users; usually the first discount below list price

______b. Price charged to person reselling to user or other vendor; discounted lower than dealer price

______c. Contain exploded views of parts, usually by groups

______d. A note of reference, explanation, or comment placed below the text on a given page; usually indicated by a small number or asterisk

______e. Suggested sale price of an item to its final user; sometimes referred to as retail price

______f. Published primarily for independent garage and parts persons, and usually lists only fast moving items such as brake parts, mufflers, shock absorbers, spark plugs, and filters

______g. A system using microfilm sheets capable of containing numerous pages of information in small segmented blocks and optical equipment capable of enlarging these blocks of information for viewing

______h. Provides a means of determining the correct part number for pricing and ordering purposes

1. Dealer price
2. Footnote
3. Illustration lists
4. Jobber price
5. List price
6. Master parts catalog
7. Microfiche
8. Quick reference catalog

Written Test

2. Select the four major catalog indexing systems from the following list by placing an "X" in the appropriate blanks.

______a. Alphabetical index by manufacturer's name

______b. Alphabetical by copyright and publishing company

______c. Alphabetical index by common name of product

______d. Numerical index of copyrights

______e. Numerical index

______f. Alphabetical index by trade name of product

3. Select types of information found in catalogs by placing an "X" in the appropriate blanks.

______a. "How to Use" page

______b. Safety in the garage—commercial first aid

______c. Part numbers and names

______d. Articles of mixed items related to catalogs

______e. Illustrations and exploded views

______f. Model and manufacturer index

______g. Related articles including advantages and disadvantages

______h. Cross references

______i. Shop hints for replacement and repairs

Written Test

4. Arrange in order the basic steps for looking up a part in a published catalog by placing the proper sequence number in the appropriate blank.

_______a. Write part numbers on pad and check stock.

_______b. Using make, year, and model, locate correct page in catalog.

_______c. Find out and jot down important information about the vehicle.

_______d. See catalog index or table of contents for breakdown of catalog sections.

_______e. If part is available, write part number on sales ticket for customer and refer to price sheet.

_______f. Determine any accessories or options on vehicle which may affect part selection.

_______g. Ask customer if any related parts or tools are needed.

_______h. Select proper part number and be sure to read all footnotes that apply to that part number.

5. Arrange in order the basic steps for looking up a part on a computer catalog by placing the proper sequence number in the appropriate blank.

_______a. From beginning parts search menu, enter Year, Make, Category.

_______b. Determine and jot down necessary and important information about the vehicle or small engine.

_______c. Determine accessories or options on vehicle or small engine application that might affect part selection.

_______d. From this screen, select appropriate groups or categories to further define the search to parts you desire.

_______e. Using the price list appropriate for the customer you are serving, move the cursor to the correct part, select the correct price, and enter a sale command.

_______f. If the part is shown to be in stock, check stock shelves and retrieve the part for the customer.

Written Test

6. Select true statements concerning how to price parts correctly by placing an "X" in the appropriate blanks.

_______a. It is very important to learn your company's discount procedures, so you will charge customers from the appropriate price sheet.

_______b. Use your price sheet only for different colors—most prices can be quoted from memory.

_______c. The "effective date" of a price sheet is important to notice because they must be kept current.

_______d. Pay close attention to information about replaced or superseded lists also shown on most price sheets.

_______e. Occasionally, a price sheet will price items by the box, rather than individually; be sure to charge the customer per item, not per box.

_______f. Long part numbers can be confusing—be careful to copy them from the catalog and price sheet correctly.

_______g. Customers buying parts for personal use are charged sales tax, and items purchased for resale are usually taxed too.

_______h. It is helpful to use a straight-edge when reading a price list because the numbers are usually very close together.

_______i. If your handwriting is not clear, have someone else take care of the order.

_______j. Giving discounts or a special price to obtain a sale is usually poor business—when in doubt about what price to charge a customer—**check with your manager!**

Written Test

7. Write a brief description of how the microfiche system works, how parts are cataloged on this system, and how a parts specialist would go about looking up a particular part on a microfiche system.

***Permission to duplicate this test is granted.**

Cataloging and Pricing
Unit 12

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Use an Engine Parts Catalog Rating ______

Comments: ____

____

Assignment Sheet 2—Use a Master Gasket Catalog Rating ______

Comments: ____

____

Assignment Sheet 3—Use a Brake Parts Catalog Rating ______

Comments: ____

____

Assignment Sheet 4—Use an Exhaust System Catalog Rating ______

Comments: ____

____

Assignment Sheet 5—Use a Chassis Parts Catalog Rating ______

Comments: ____

____

Assignment Sheet 6—Use a Computer Parts Catalog Rating ______

Comments: ____

____

Unit Evaluation Form

Job Sheet 1—Set Up a Catalog Indexing System Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________ Date __________

Student Signature ______________________ Date __________

*Permission to duplicate this form is granted.

Cataloging and Pricing
Unit 12

Teacher Supplement 1—Catalogs vs. Computers

The parts industry, as many other parts of life in the United States, is undergoing a transformation in the way it maintains records and catalog parts. As more and more makes and models of automobiles and small engines flood the market, maintaining a parts supply becomes more of a challenge. Large warehouses stock more than 100,000 parts numbers to meet jobber demands, and industry estimates call for an additional 30,000 parts numbers to be added to that inventory during the 1990s. So, how do you keep track of so many parts and applications?

For years automotive and small engine parts manufacturers produced catalogs and price lists in periodically updated publications. The parts counter at most automotive stores sported at least one, and sometimes several racks of thick catalogs which were arranged alphabetically according to manufacturer, trade name of the product, common name of the product, or a numerical index which incorporated the other three methods. In all cases, a parts specialist would have to know how the catalogs were arranged, the peculiarities of each catalog, the method in which the catalogs were updated, etc. Also, the physical task of publishing and printing an up-to-date catalog which tracks the rapid changes in makes, models, and part applications is a massive and expensive one.

In the early 1980s computer systems began to find their way into parts stores to maintain records on inventory and retain continually updated parts lists and prices. Several firms such as Automatic Data Processing, Inc., and Triad, began offering services of custom-making catalog computer programs for use by various automotive dealers and parts suppliers. For instance, ADP's Dealer Services Division created and supports a parts cataloging service for General Motors dealers called ADEPT. Triad designs and supports similar systems for major parts suppliers such as one might find in a hometown auto parts store.

These services include providing software with pre-loaded lists of parts and their corresponding inventory and order numbers for whatever variety of parts the store desires. For instance, O'Reilly Auto Parts may want to stock a complete set of WIX oil, air, and fuel filters for most popular automobiles and pickup trucks. Triad representatives would supply computer data base programs containing all of the WIX model numbers and current prices. And, as prices change and additional model numbers are added, or deleted by WIX, Triad would provide updated software to O'Reilly stores. Other examples besides WIX would be NAPA parts, GM Delco parts, Wagner-Lockheed brake parts, TRW, Federal Mogul and Timken bearings, Briggs & Stratton Corp. small engine parts, Champion spark plugs, etc. The variety is endless, but computer service companies can provide the software for any line of parts a store manager might wish to carry.

Teacher Supplement 1

Although the idea of looking up parts on a computer screen seems much more appealing than rummaging through catalogs, most auto parts store managers agree catalogs will remain a fixture in their stores for some time. Actual paper catalogs are still useable when the computer is "down." Catalogs usually include far more additional information in footnotes and application guides than computer screens. And, most computer programs only carry the most popular parts items back to about the 1968 model year. This situation is based on the "80/20 rule" which indicates about 80 percent of the parts sales are accounted for by 20 percent of the tens of thousands of parts a dealer might stock. So, for out-of-the-ordinary parts applications and lesser-used older applications, catalogs will remain a vital part of the parts industry.

Catalogs are usually dated and alphabetized and updated issues are designed to replace and consolidate information found in obsolete issues. Depending upon the vendor, such catalogs are completely updated once or twice a year, or special update inserts are provided when changes are necessary.

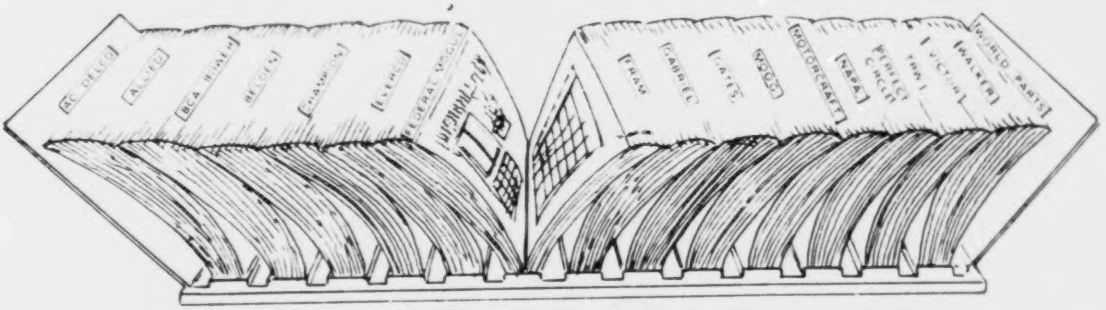
A typical computer catalog is "menu-driven," meaning each menu or list of questions leads the parts specialist closer and closer to the part number he or she desires to access. A good example can be found in many mass-marketer discount stores such as Wal-Mart where a computer sits amid popular auto parts and allows customers to determine their own filter, battery, and spark plug numbers by touching various prompts on the screen. Once such selection is made, the computer prints out a small report to allow the customer to browse the aisles for the proper parts for her or his car.

A parts specialist using a computer catalog will use the same method, only the number of parts from which to choose is much larger. Also, most computer systems tied to the parts inventory will be used as a point-of-sale cash register. Once a part has been selected and retrieved from the shelf, (or ordered from the warehouse if it is not in stock), the parts specialist can complete the sale, printing out the part name, part number, and appropriate price. Usually such a system will automatically order a replacement part for the next day's delivery to maintain the store's desired shelf inventory.

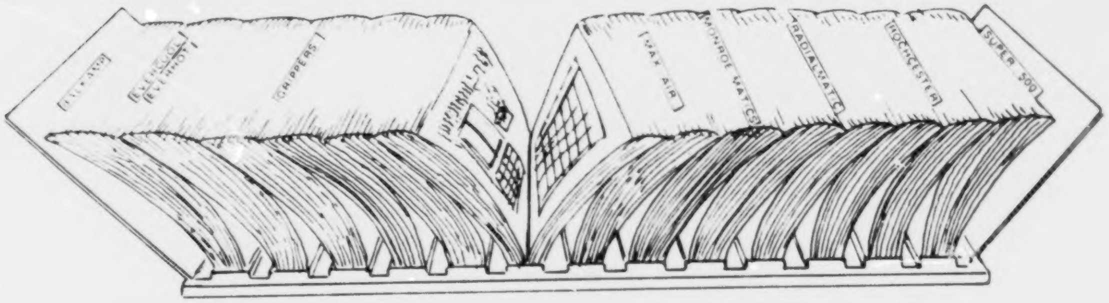
So, although computers are becoming more popular in parts stores across the country, more than 60 percent of such stores used computer parts cataloging by the early 1990s, parts specialist will still have to be familiar with parts catalogs and how they are organized. Both methods will be important in the parts industry for the foreseeable future.

***Permission to duplicate this supplement is granted.**

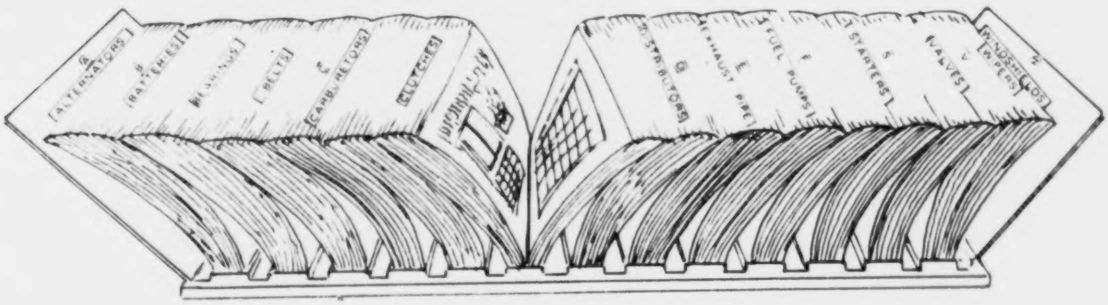
Major Catalog Indexing Systems


AC DELCO
ALLIED
BCA BOWER
BELDEN
CHAMPION
EVERCO
FEDERAL MOGUL
FRAM
GABRIEL
GATES
MOOG
MOTORCRAFT
NAPA
PERFECT CIRCLE
TRW
VICTOR
WALKER
WORLD PARTS

1. Alphabetical index by manufacturer's name

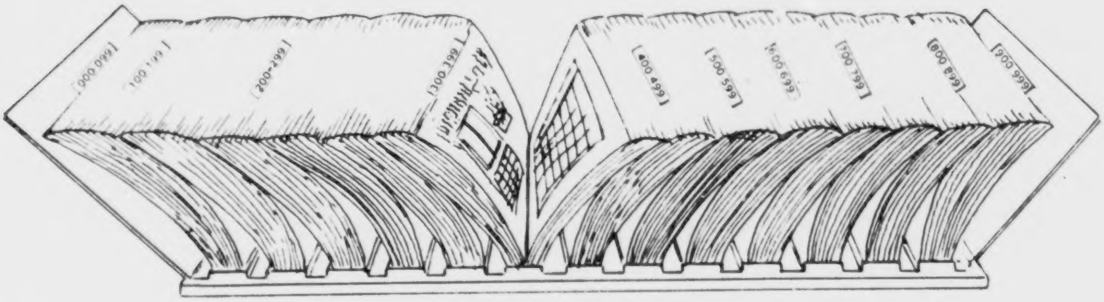

EVERCOOL
EVERHOT
GRIPPERS
MAX AIR
MONROE MATICS
RADIALMATIC
ROCHESTER
SUPER 500

2. Alphabetical index by trade name


A
ALTERNATORS
B
BATTERIES
BEARINGS
BELTS
C
CARBURETORS
CLUTCHES
D
DISTRIBUTORS
E
EXHAUST PIPE
F
FUEL PUMPS
S
STARTERS
V
VALVES
W
WINDSHIELDS
WIPERS

3. Alphabetical index by common name of product

Major Catalog Indexing Systems
(Continued)


000-099
100-199
200-299
300-399
400-499
500-599
600-699
700-799
800-899
900-999

4. Numerical index

(NOTE: The Weatherly Index is the best known numerical index system; there are ten major groups of numbers in the Weatherly Index.)

Number Groups	Parts That Comprise the Groups
000-099	Centerdrive (Items in the center or drive section of an automobile)
100-199	Frame and Axle
200-299	Body and Fender (Items on the body and in the interior)
300-399	Gaskets and Bearings (Gasket materials and seals also included)
400-499	Cooling System
500-599	Ignition and Lighting
600-699	Fuels and Lubrication
700-799	Shop Supplies
800-899	Hand Tools
900-999	Equipment

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Cataloging and Pricing
Unit 12

Information Sheet

1. **Terms and definitions related to cataloging and pricing**

    a. **Dealer price** — Price charged to other dealers within the system or industry who are authorized to sell to users; usually the first discount below list price

    b. **Footnote** — A note of reference, explanation, or comment placed below the text on a given page; usually indicated by a small number or asterisk

    c. **Illustration lists** — Contain exploded views of parts, usually by groups

    d. **Jobber price** — Price charged to person reselling to user or other vendor; discounted lower than dealer price

    e. **List price** — Suggested sale price of an item to its final user; sometimes referred to as retail price

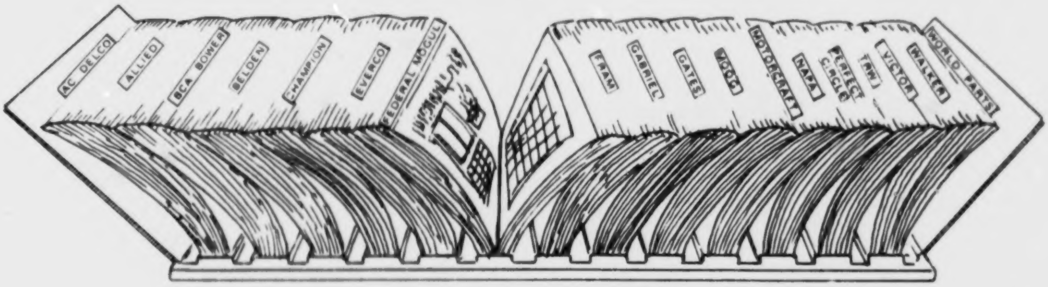
    f. **Master parts catalog** — Provides a means of determining the correct part number for pricing and ordering purposes

    g. **Microfiche** — A system using microfilm sheets capable of containing numerous pages of information in small segmented blocks and optical equipment capable of enlarging these blocks of information for viewing

    h. **Quick reference catalog** — Published primarily for independent garage and parts persons, and usually lists only fast moving items such as brake parts, mufflers, shock absorbers, spark plugs, and filters

2. **Major catalog indexing systems**

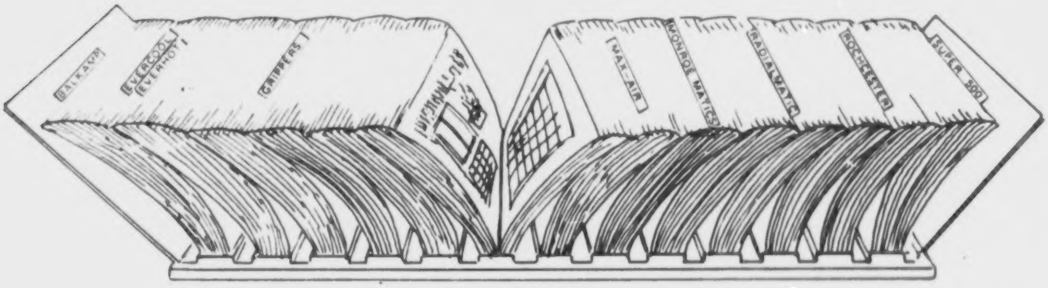
    a. Alphabetical index by manufacturer's name


AC DELCO
ALLIED
BCA BOWER
BELDEN
CHAMPION
EVERCO
FEDERAL MOGUL
FRAM
GABRIEL
GATES
MOOG
MOTORCRAFT
NAPA
PERFECT CIRCLE
TRW
VICTOR
WALKER
WORLD PARTS

Information Sheet

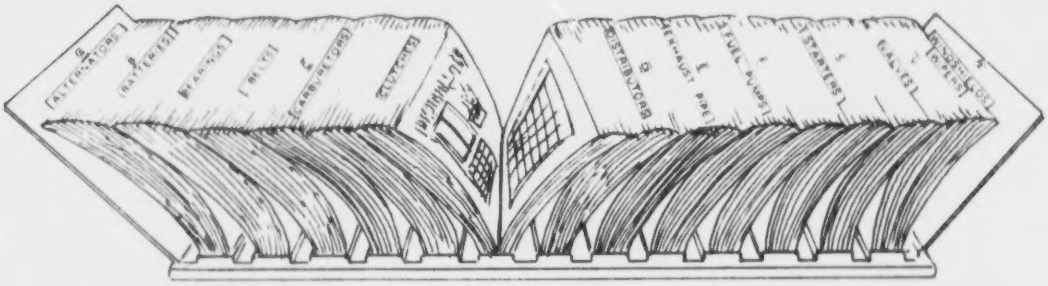
- Advantage — Easy to file
- Disadvantage — Counterperson must know all the products made by each manufacturer

b. Alphabetical index by trade name of product


BALKAMP
EVERCOOL
EVERHOT
GRIPPERS
MAX-AIR
MONROE MATICS
RADIALMATIC
ROCHESTER
SUPER 500

- Advantage — Easy to find major trade names
- Disadvantage — Hard to file "all products" catalogs which list different items all made by one manufacturer

c. Alphabetical index by common name of product


ALTERNATORS
BATTERIES
BEARINGS
BELTS
CARBURETORS
CLUTCHES
DISTRIBUTORS
EXHAUST PIPE
FUEL PUMPS
STARTERS
VALVES
WIPERS

- Advantage — Easy to file parts with one word names

  Examples: Belts, batteries, starters, bulbs

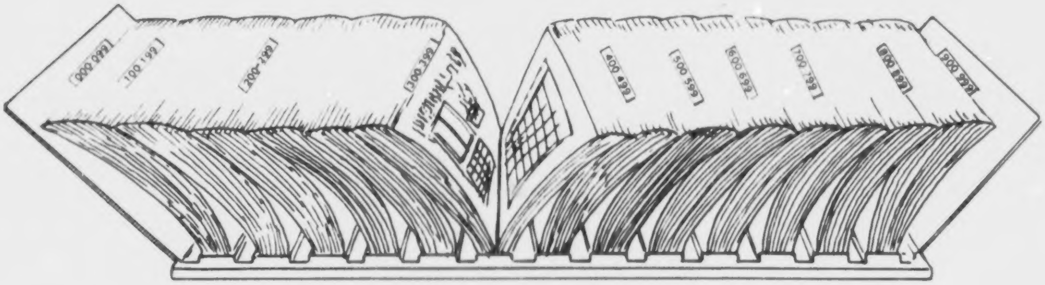
- Disadvantage — Confusion as to where to file two-word parts

  Examples: Wheel bearings, piston rings, valve cover gasket

Information Sheet

d. Numerical index

Note: The most famous numerical index is the Weatherly Index, a system by which most automotive parts are cataloged according to ten blocks of three-digit code numbers. This system attempts to catalog various parts from numerous manufacturers in one catalog system. Although still in use, the Weatherly Index is becoming outdated because of the size of the parts inventory needed to service all the modern makes and models of automobiles and trucks. Computerized parts cataloging is rapidly replacing it as an industry standard.



Example:

Number Groups	Parts That Comprise the Groups
000-099	Centerdrive (Items in the center or drive section of an automobile)
100-199	Frame and Axle
200-299	Body and Fender (Items on the body and in the interior
300-399	Gaskets and Bearings (Gasket materials and seals also included)
400-499	Cooling System
500-599	Ignition and Lighting
600-699	Fuels and Lubrication
700-799	Shop Supplies
800-899	Hand Tools
900-999	Equipment

Information Sheet

- Advantage — Easy to learn because related items are grouped together
- Disadvantage — Difficult to file mixed-items catalogs

3. **Types of information found in catalogs**

   a. "How to Use" page

   Note: This is usually located at the beginning of the catalog and, because each catalog can be different, the parts person should review this before ever attempting to look up a part for a customer.

   b. List of abbreviations used

   c. Part numbers and names

   d. Model applications

   e. Footnotes containing additional information

   f. Illustrations and exploded views

   g. Model and manufacturer index

   h. Supersessions and interchangeable parts

   i. Cross references

   j. Shop hints for replacement and repairs

4. **Basic steps for looking up a part in a catalog**

   a. Determine and jot down necessary and important information about the vehicle or small engine.

   Example: Make, model, year, serial number or Vehicle Identification Number (VIN), engine and engine size, etc.

   b. Determine any accessories or options on vehicle or small engine applications that might affect part selection.

   Example: For vehicles: air-conditioning, power steering, type of transmission. For small engines: power mower, pump or tiller use, step-down gear box.

Information Sheet

c. See catalog index or table of contents for breakdown of catalog sections.

d. Using make, model, year, locate correct page in catalog.

e. Select proper part number and **BE CERTAIN** to read **ALL** footnotes that apply to the part number.

f. Ask customer if any related parts or tools are needed.

g. Write part numbers on pad and check stock.

h. If part is available, write part number on sales ticket for customer and refer to price sheet for proper pricing.

5. **Basic steps for looking up a part on a computer catalog**

Note: Because of the numerous computer systems in use by the different parts chains and privately owned stores, this discussion will reflect a general procedure found on most systems. The parts specialist will have to become familiar with the specific system in a given store, although he or she should be familiar enough with computers to understand how to select menu items in a question-and-answer type search. The following search will seek various parts for a Chevrolet.

a. Determine and jot down necessary and important information about the vehicle or small engine.

Example: Make, model, year, serial number or Vehicle Identification Number (VIN), engine and engine size, etc.

b. Determine accessories or options on vehicle or small engine applications that might affect part selection.

Example: For vehicles: air-conditioning, power steering, type of transmission. For small engines: power mower, pump or tiller use, step-down gear box.

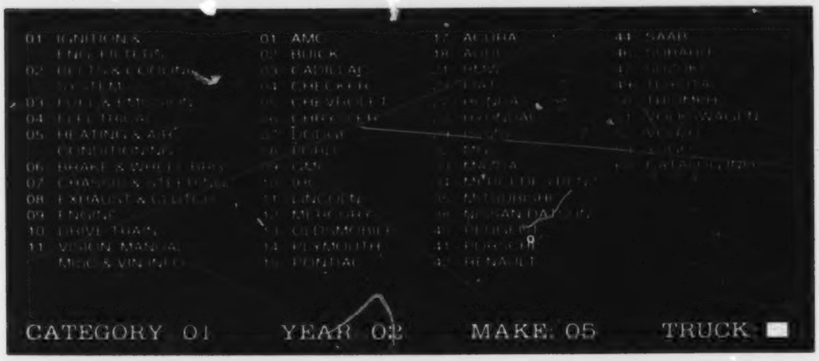
Information Sheet

c. From beginning parts search menu, enter Year, Make, Category.

Note: In most cases to obtain the parts search screen, a parts specialist will have to enter a personal identification code, or "point-of-sale" code, or some other password type entry to begin the search.

Screen images courtesy of Triad Systems Corp.

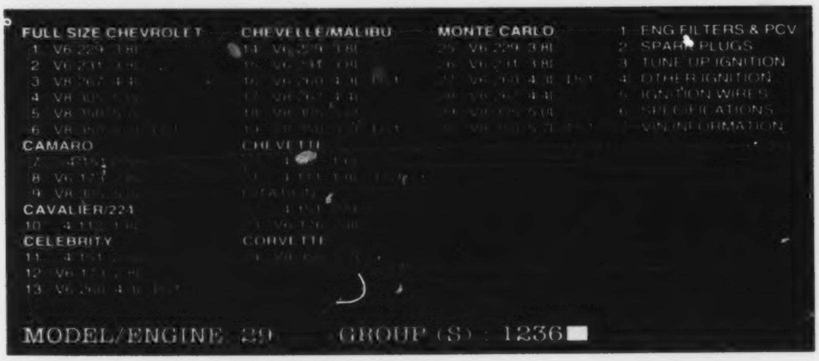
Example Screen


01 AMC
02 BUICK
03 CADILLAC
04 CHECKER
05 CHEVROLET
17 ACURA
44 SAAB

CATEGORY 01 YEAR 02 MAKE: 05 TRUCK

d. From this screen, select appropriate groups or categories to further define the search to parts you desire.

Example Screen


FULL SIZE CHEVROLET
CHEVELLE/MALIBU
MONTE CARLO
CAMARO
CAVALIER/224
CELEBRITY
CORVETTE
1 ENG FILTERS & PCV
2 SPARK PLUGS
3 TUNE UP IGNITION
4 OTHER IGNITION
5 IGNITION WIRES
6 SPECIFICATIONS
7 VIN INFORMATION

MODEL/ENGINE 29 GROUP (S) : 1236

In this screen, "Model/Engine" selection was "29," or V-8--305 5.0L. And "Groups" of information sought were 1, 2, 3, & 6, which selected Eng. Filters & PCV; spark plugs; tune up ignition; and specifications.

e. Select proper part number and **BE CERTAIN** to read **ALL** footnotes (if any) that apply to the part number.

BEST COPY AVAILABLE

Information Sheet

f. Ask customer if any related parts or tools are needed.

Note: Many computer catalogs offer parts in related groups and include a list of parts, services, and supplies that might be needed in the replacement or installation of any given part. This allows the parts specialist to recommend certain other parts to offer additional service to the customer and, as a result, increase sales.

g. If the part is shown to be in stock, check stock shelves and retrieve the part for the customer.

h. Using the price list appropriate for the customer you are serving, move the cursor to the correct part, select the correct price, and enter a sale command.

Note: In most cases, this type of command will automatically print an invoice or sales receipt, and, at the same time, update the store's inventory and place an order with the supplier for a replacement part to refill the inventory to a predetermined level.

6. How to price parts correctly

a. Manufacturer's price sheets come in many forms.

- Some have list price, dealer price, and jobber price all together on one sheet.

Example:

Suggested Prices			
Part No.	List Price	Dealer Price	Jobber Price
A-239	16.50	14.50	12.50
C-416	3.19	2.90	2.79
J-118	69.10	64.29	60.05

Information Sheet

- Some have different colored pages for each type of price list.

Examples:

Blue Sheet SUGGESTED JOBBER NET PRICES		Green Sheet SUGGESTED DEALER PRICES	
Catalog Number	Jobber Price	Catalog Number	Dealer Price
2002	11.50	2002	13.50
2003	12.50	2003	14.50
2004	13.50	2004	15.50
2005	14.50	2005	16.50
2006	15.50	2006	17.50
2007	16.50	2007	18.50
2008.	17.50	2008	19.50
2009	18.50	2009	20.50

- These lists quote different prices depending upon the classification of the customer.
- It is very important to learn your company's discount procedures, so you will charge customers from the appropriate price sheet.

  Note: Typical classifications are: consumers; fleet accounts; dealers; independent garages; industrial accounts; jobbers; government agencies.

b. Use your price list every time you make a sale—do not quote a price from memory.

c. The "effective date" of a price sheet is important to notice because price sheets must be kept current.

d. Pay close attention to information about replaced or superseded lists also shown on most price sheets.

Example:

EFFECTIVE SEPTEMBER 1, 1994
(Replaces Price List Dated July 1, 1993)
(Prices subject to change without notice)

e. Occasionally, a price sheet will price items by the box, rather than individually.

- This is especially true for small parts such as nuts and bolts, and cotter pins.

Information Sheet

- Be sure to charge the customer per item, not per box.

  Example: Customer comes in to buy 12 headbolts, part number A43. you look in the price sheet and the price for A43 is $3 per box. There are 10 headbolts in each box. How much would you charge the customer? $3.60, right?

f. Long part numbers can be confusing—be careful to copy them from the catalog and price sheet correctly.

Example: If the part number for a brake drum is BD600010 in the catalog, and you copy it as BD600100—when you go to the price sheet or screen, the price you quote the customer is probably going to be wrong.

g. Customers buying parts for personal use are charged sales tax, but items purchased for resale are usually exempt from sales tax.

h. It is helpful to use a straight-edge when reading a price list from a catalog page because the numbers are very close together.

Note: Usually, on a computer screen, parts prices are much easier to read correctly because they are located in a separate price "box" or are the only price on the screen when a given part is selected.

i. If your handwriting is not clear, **PRINT**.

j. Giving discounts or a special price to obtain a sale is usually poor business—when in doubt about what price to charge a customer—check with your manager.

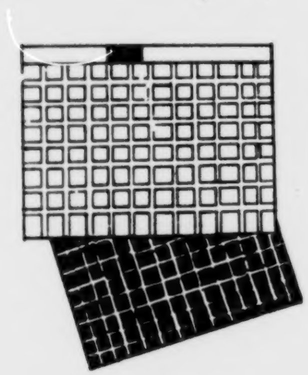
Note: Keeping catalogs and price sheets up to date is vital because it affects your company's profit, sales, investment, and inventory control as well as the ability to serve customers quickly and efficiently. Also, you must remember that your own future with a company is tied quite closely to the profitability of the firm.

7. The microfiche system and how to use it

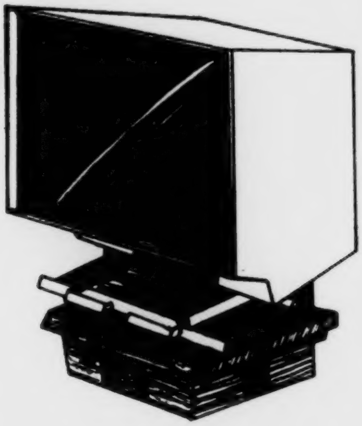
Note: Many automotive dealers record their catalog pages on microfilm and use microfiche readers; this eliminates much of the space needed for catalog racks. Still, even this technology is becoming outdated, being replaced with stand-alone computer catalog and price sheets.

Information Sheet

a. Catalog pages are reduced and put in rows of microimages on microfiche cards.



Microfiche Cards



Microfiche Reader

b. Since images are too small to read with the naked eye, microfiche readers are used to magnify the images and project them onto a viewing screen.

c. The microfiche cards are then labeled according to year, model, and types of parts shown on each card.

d. When a customer gives you the necessary information to look up a part, you simply locate the corresponding card and place it in the reader.

e. Find appropriate grouping and page for part needed.

f. Choose correct part number.

Note: The same information is given in catalogs and on microfiche cards. The advantage of microfilm is the tremendous amount of material that can be condensed onto one card; for example, a catalog consisting of 1,000 pages or more could easily be contained on one 4″ × 6″ card.

Cataloging and Pricing
Unit 12

Assignment Sheet 1—Use an Engine Parts Catalog

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers are correct	______

Introduction: The lifeblood of the parts business lies in catalogs and lists of parts. This exercise will familiarize you with catalogs and how they are arranged. Your instructor will supply you with appropriate catalogs and price sheets.

Directions: Answer the following questions using available catalogs and price sheets.

A. Locate and study the "How to Use" section of an appropriate engine parts catalog.

Note: This section is usually located on the inside of the front cover or the first pages of the catalog; some catalogs may not have a "How to Use" section, so the index will have to be used to locate needed sections and information.

B. Locate and study the symbol and suffix sections of the catalog and list the symbol or suffix for the following major engine parts.

1. ______________ Valve lifter
2. ______________ Chrome ring set
3. ______________ Timing gear
4. ______________ Hollow stem valve
5. ______________ Valve stem oil seal
6. ______________ Valve spring
7. ______________ Cast iron type piston
8. ______________ Bronze backed babbit bearing

Assignment Sheet 1

C. Locate and identify the make of the car, using the following information.

Model Make

1. Caprice ____________________
2. Acclaim ____________________
3. Tracker ____________________
4. 300SX ____________________
5. Caravan ____________________
6. Achieva ____________________
7. Grand Am ____________________
8. Tempo ____________________
9. Escort GT ____________________
10. Intrepid ____________________

D. Given the following information, look up and list the part no. and prices for the following:

1992 Mustang GT 5.0L. V-8					
Quantity	Part No.	Description	List Price	Net Price	Total
1		Valve lifter (stock)			
8		Piston (stock)			
1		Piston ring set (chrome)			
1		Oil pump (stock)			
2		Intake valve (stock			
4		Exhaust valve (stock)			
16		Valve seals (positive type)			

Assignment Sheet 1

E. Using the part numbers from the previous section, locate and list the application using the numerical listing section of the catalog.

	Part No.	Application
1. Valve lifter		
2. Piston (stock)		
3. Piston ring set		
4. Oil pump		
5. Intake valve		
6. Exhaust valve		
7. Valve seals		

Cataloging and Pricing
Unit 12

Assignment Sheet 2—Use a Master Gasket Catalog

Name ______________________ Overall Rating ______________

Evaluation criteria	Rating
Directions have been followed	______
Answers are correct	______

Introduction: Gaskets are found throughout automobiles and small engines. This exercise will familiarize you with gasket catalogs and how they are arranged. Your instructor will supply you with appropriate catalogs and price sheets.

Directions: Answer the following questions using available catalogs and price sheets.

A. Locate and study the "How to Use" section of an appropriate master gasket catalog.

Note: If there is not a "How to Use" section, study the index and/or table of contents section to become familiar with the various sections.

B. Locate and list suffix or prefix letters that indicate the following gaskets.

	Suffix or Prefix
1. Head gasket set	______________
2. Timing cover gasket	______________
3. Pan gasket	______________
4. Full gasket set	______________
5. Intake manifold gasket	______________
6. Fuel pump gasket	______________
7. Water pump gasket	______________
8. Exhaust pipe	______________
9. Valve cover gasket set	______________
10. Water outlet gasket	______________

Assignment Sheet 2

C. Given the following information, look up and list the part number and prices.

1993 Aerostar, 4.0L. eng. 6 cyl. with automatic overdrive transmission

		Price	
	Part No.	List	Net
1. Valve cover gasket set			
2. Intake manifold set			
3. Timing cover set			
4. Head gasket set			
5. Transmission pan gasket			
6. Rear wheel bearing retainer			

D. Locate and study the "Superseded By" section of the catalog.

Note: Some catalogs may not have the "Superseded By" section incorporated in the catalog but a separate section; also make note of the abbreviations used to designate the current status of the part numbers.

Cataloging and Pricing
Unit 12

Assignment Sheet 3—Use a Brake Parts Catalog

Name ______________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	_____
Answers are correct	_____

Introduction: Brake parts are a mainstay of the parts business. All vehicles are equipped with brakes and all brake systems eventually must be serviced. This exercise will familiarize you with brake parts catalogs and how they are arranged. Your instructor will supply you with appropriate catalogs and price sheets.

Directions: Answer the following questions using available catalogs and price sheets.

A. Locate and study the "How to Use" section of an appropriate brake parts catalog; make note of how the catalog is sectioned or divided into groupings of parts.

B. Study the "Application Listings" section of the catalog.

C. Locate and list the names for the following abbreviations.

1. Adj. ______________________
2. Brk.(s) ______________________
3. D.B. ______________________
4. Dia. ______________________
5. M. cyl. ______________________
6. O.D. ______________________
7. Pwr. brks. ______________________
8. Std. ______________________
9. Sec. ______________________
10. Wo/ ______________________

Assignment Sheet 3

D. Given the following information, locate and list the part numbers and prices of parts for a 1979 Firebird, V-8 engine, standard power disc front brakes, rear drum brakes.

			Price		
Quantity	Part No.	Description	List	Net	Total
1		Disc pad set			
1		Rear brk. shoes			
1		Master cylinder			
2		Repair kit, caliper wo/piston			
2		Repair kit, wheel cyl. wo/pist.			
2		Shoe return spring kit			
2		Shoe hold down spring kit			
1		Left self adjuster repair kit			
1		Right self adjuster repair kit			

E. Locate and study the general information section as well as the illustrated section of the catalog.

Cataloging and Pricing
Unit 12

Assignment Sheet 4—Use an Exhaust System Catalog

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers are correct	______

Introduction: Exhaust systems must operate in a high-temperature, corrosive atmosphere. Although engineered to combat these ravaging effects of rust and corrosion, exhaust parts regularly need to be replaced. This exercise will familiarize you with exhaust system parts catalogs and how they are arranged. Your instructor will supply you with appropriate catalogs and price sheets.

Directions: Answer the following questions using available catalogs and price sheets.

A. Locate and study the "How to Use" section of an appropriate exhaust system catalog.

B. Study the table of contents or index and pay close attention to supplementary information included in the catalog.

Note: Supplementary information can include information such as model year identification, vehicle model index, abbreviations, cross reference charts, gasket and flange charts, numerical listing by part number, etc.)

C. Given the following information, look up and list the part numbers and prices for a 1989 Pontiac 6000, 2.5L, 4 cylinder engine.

Quantity	Part No.	Description	List Price	Net Price	Total
1		Tailpipe			
1		Exh. header pipe			
1		Connector pipe			
1		Muffler clamp			
1		Rear insulator			

Assignment Sheet 4

D. Locate and list the abbreviations for the following parts.

	Part name	Abbreviation
1.	Barrel	____________
2.	Bracket	____________
3.	California	____________
4.	Clamp	____________
5.	Coupe	____________
6.	Except	____________
7.	Exhaust	____________
8.	Flange	____________
9.	Heavy duty	____________
10.	Hanger	____________
11.	Inside diameter	____________
12.	Left hand	____________
13.	Not available	____________
14.	Not required	____________
15.	Right hand	____________
16.	With	____________
17.	Without	____________

E. Locate and list the following information from the accessory section.

1. Different types of full circle clamps

   a) ____

   b) ____

   c) ____

Assignment Sheet 4

2. Different types of straight tubing

a) ______________________

b) ______________________

c) ______________________

3. Different types of connectors

a) ______________________

b) ______________________

c) ______________________

4. Different types of reducers

a) ______________________

b) ______________________

c) ______________________

d) ______________________

5. Different types of clamps

a) ______________________

b) ______________________

c) ______________________

d) ______________________

Assignment Sheet 4

F. A customer wants to convert a single exhaust system to dual exhaust. The car is a 1990 Camaro with a 350 C.I.D. engine. The existing exhaust needs replacement. List all parts and prices to complete the conversion. Use the dual conversion listings.

Cataloging and Pricing
Unit 12

Assignment Sheet 5—Use a Chassis Parts Catalog

Name ______________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers are correct	______

Introduction: Chassis parts must be maintained in good repair to hold a vehicle's "track" in alignment. If alignment is not adjusted properly, the vehicle will pull to one side or another, get poor fuel mileage, and wear tires. This exercise will familiarize you with chassis parts catalogs and how they are arranged. Your instructor will supply you with appropriate catalogs and price sheets.

Directions: Answer the following questions using available catalogs and price sheets.

A. Locate and study the "How to Use" section of an appropriate chassis parts catalog.

Note: As stated earlier, some catalogs will not have a "How to Use" section so the table of contents or index will have to be studied.

B. A customer calls an order in wanting chassis parts for a 1978 Corvette. The parts ordered are both lower ball joints, right and left upper control arm bushings, idler arm, and the left outer tie rod. List all parts and prices to fill the order.

Quantity	Part No.	Description	List Price	Net Price	Total

Assignment Sheet 5

C. Use the cross reference section of your catalog to cross reference numbers from the parts in the previous question to General Motors part number.

	Part	Your Part Numbers	General Motors Numbers
1.	Ball joint		
2.	Upper control arm bushings		
3.	Idler arm		
4.	Tie rod		

Cataloging and Pricing
Unit 12

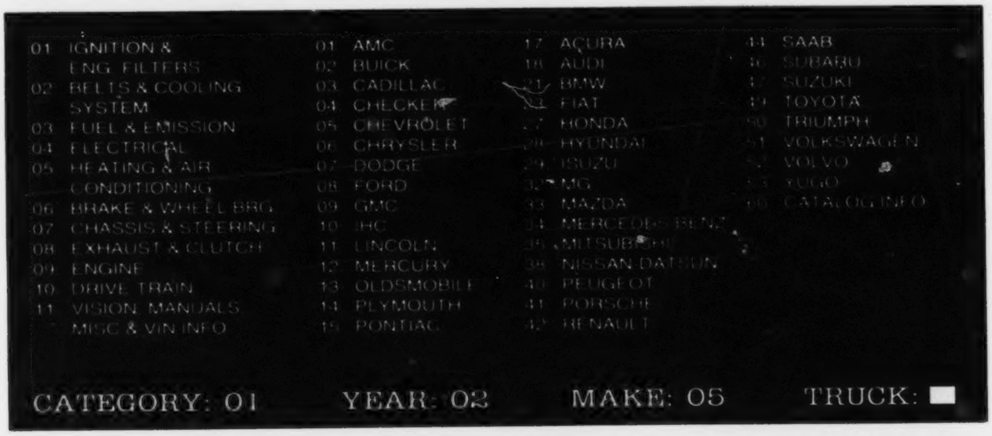
Assignment Sheet 6—Use a Computer Parts Catalog

Name ______________________________ Overall Rating ____________

Evaluation criteria	**Rating**
Directions have been followed	______
Answers are correct	______

Introduction: In Objective 5 you became familiar with how to look up parts in a computer catalog to determine parts information.

Directions: Using the computer screen images and the information provided, locate information needed to determine correct parts for the situations given.



```
01  IGNITION &              01  AMC            17  ACURA            44  SAAB
    ENG FILTERS             02  BUICK          18  AUDI             46  SUBARU
02  BELTS & COOLING         03  CADILLAC       21  BMW              47  SUZUKI
    SYSTEM                  04  CHECKER        [illegible]  FIAT    49  TOYOTA
03  FUEL & EMISSION         05  CHEVROLET      27  HONDA            50  TRIUMPH
04  ELECTRICAL              06  CHRYSLER       28  HYUNDAI          51  VOLKSWAGEN
05  HEATING & AIR           07  DODGE          29  ISUZU            52  VOLVO
    CONDITIONING            08  FORD           32  MG               53  YUGO
06  BRAKE & WHEEL BRG       09  GMC            33  MAZDA            66  CATALOG INFO
07  CHASSIS & STEERING      10  IHC            34  MERCEDES BENZ
08  EXHAUST & CLUTCH        11  LINCOLN        35  MITSUBISHI
09  ENGINE                  12  MERCURY        38  NISSAN DATSUN
10  DRIVE TRAIN             13  OLDSMOBILE     40  PEUGEOT
11  VISION MANUALS          14  PLYMOUTH       41  PORSCHE
[illegible]  MISC & VIN INFO  15  PONTIAC      42  RENAULT

CATEGORY: 01        YEAR: 02        MAKE: 05        TRUCK: ▯
```

Courtesy of Triad Systems Corp.

Computer Screen for A and B

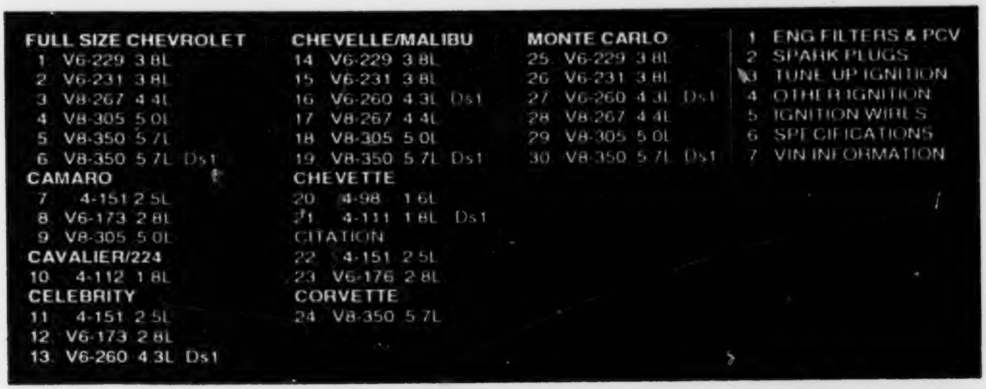
A. A customer asks for a clutch pressure plate, clutch disc, and clutch throw-out bearing for a 1991 Ford Escort GT. Locate information needed to determine correct parts.

1. Category ____________
2. Year ____________
3. Make ____________
4. Truck ____________

Assignment Sheet 6

B. A local mechanic has called your store about an air conditioner expansion valve for a 1990 Chevrolet S-10 pickup truck. Provide information needed to determine correct part.

1. Category ____________
2. Year ____________
3. Make ____________
4. Truck ____________



```
FULL SIZE CHEVROLET     CHEVELLE/MALIBU          MONTE CARLO              1  ENG FILTERS & PCV
 1  V6-229  3.8L        14  V6-229  3.8L         25  V6-229  3.8L         2  SPARK PLUGS
 2  V6-231  3.8L        15  V6-231  3.8L         26  V6-231  3.8L         3  TUNE UP IGNITION
 3  V8-267  4.4L        16  V6-260  4.3L  Ds1    27  V6-260  4.3L  Ds1    4  OTHER IGNITION
 4  V8-305  5.0L        17  V8-267  4.4L         28  V8-267  4.4L         5  IGNITION WIRES
 5  V8-350  5.7L        18  V8-305  5.0L         29  V8-305  5.0L         6  SPECIFICATIONS
 6  V8-350  5.7L  Ds1   19  V8-350  5.7L  Ds1    30  V8-350  5.7L  Ds1    7  VIN INFORMATION
CAMARO                  CHEVETTE
 7   4-151  2.5L        20   4-98   1.6L
 8  V6-173  2.8L        21   4-111  1.8L  Ds1
 9  V8-305  5.0L        CITATION
CAVALIER/224            22   4-151  2.5L
10   4-112  1.8L        23  V6-176  2.8L
CELEBRITY               CORVETTE
11   4-151  2.5L        24  V8-350  5.7L
12  V6-173  2.8L
13  V6-260  4.3L  Ds1
```

Courtesy of Triad Systems Corp.

Computer Screen for C and D

C. You have made your original search selections to find engine parts for a 1976 Chevrolet Chevette. You are searching for an ignition wiring harness for a 1.6L 4-cylinder.

1. What "Model/Engine" prompt do you enter? ____________

2. What "Group" do you select? ____________

D. You have made your original search selections to find additional tune-up specifications for a 1985 Chevrolet Celebrity equipped with a 4.3L V-6.

1. What "Model/Engine" prompt do you enter? ____________

2. What "Group" do you select? ____________

Cataloging and Pricing
Unit 12

Job Sheet 1—Set Up a Catalog Indexing System

Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criterion	**Rating**
Catalogs arranged according to indexing system selected	______

A. Introduction: As you learned in Objective 2, there are several methods of arranging parts catalogs. This exercise allows you to demonstrate your skills in arranging catalogs in a variety of ways.

B. Equipment and Materials

- Catalog racks and dividers or tabs
- Assorted catalogs and price sheets
- Counter or table

C. Procedure

☐ 1. Set up racks according to the number of catalogs.

☐ 2. Choose one of the four major catalog indexing systems.

  - Alphabetical by manufacturer's name
  - Alphabetical by trade name
  - Alphabetical by common name
  - Numerical

☐ 3. Arrange catalogs and price sheets according to the index system to be used.

☐ 4. Prepare and insert dividers and/or tabs for proper separation of catalogs and price sheets.

Evaluator's comments: ______________________________

____

____

Sales Policies and Procedures
Unit 13

Objective Sheet

Unit Objective

After completing this unit, the student should be able to complete a sales transaction and handle exchanges and returns. The student should demonstrate these competencies by completing the assignment sheets and job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to sales policies and procedures with their correct definitions.
2. Match terms related to pricing with their correct definitions.
3. List office machines commonly used in a parts store.
4. Use a tax table.
5. Select true statements concerning procedures for counting change.
6. List information needed to complete a sales ticket or invoice.
7. Select true statements concerning the procedure for accepting checks.
8. Select true statements concerning the procedure for accepting credit cards.
9. List two special precautions for handling money orders.
10. List two special precautions for handling travelers checks.
11. Select true statements concerning handling exchange items and cores.
12. Select true statements concerning handling defective items.
13. Explain the procedure for making a refund.
14. Count change. (Assignment Sheet 1)

Objective Sheet

15. Complete a sales ticket. (Assignment Sheet 2)

16. Accept checks. (Assignment Sheet 3)

17. Complete a credit memo. (Assignment Sheet 4)

18. Process a credit card sale. (Job Sheet 1)

19. Make a refund. (Job Sheet 2)

20. Send and verify receipt of a Fax message. (Job Sheet 3)

Sales Policies and Procedures
Unit 13

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review the teaching suggestions included in the delivery and application section below and plan classroom activities. Review suggested supplemental resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.

- Obtain a number of defective parts or "cores" that might be encountered by a parts specialist working in a parts store.
- Make transparencies from transparency masters included in this unit.
- Select teacher components (written test, unit evaluation form) you want to distribute to your students. Copy and prepare these components for distribution.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Teaching Suggestions

Objective 1 Match terms related to sales policies and procedures with their correct definitions.

- Read and discuss terms and definitions. **(Listening for content; orally expressing a thought)**

Suggested Activities

Objective 2 Match terms related to pricing with their correct definitions.

- Read and discuss various pricing terms presented in this objective. Try to give examples of each to enhance comprehension. Discuss reasons for various prices within the parts industry. **(Reading/listening for content; orally expressing a thought; adapting to the organization's traditional mode of operation)**

- Arrange for a local parts store manager to visit class to discuss pricing policies and other sales policies and procedures. **(Listening for content)**

Objective 3 List office machines commonly used in a parts store.

- Arrange for students to use a personal computer for applications that might be necessary as a parts specialist.

- Demonstrate the use of an electronic calculator and provide students with an opportunity to use electronic calculators to compute sales totals. **(Listening for content; math)**

- Demonstrate and discuss the use of a cash drawer and how a cash register is arranged. Use Transparency 1 to show a typical cash drawer setup. **(Listening for content; orally expressing a thought; math)**

- Hand out Job Sheet 3 "Send and Verify Receipt of a FAX Message." Read and discuss directions and evaluation criteria with students. Demonstrate the procedure outlined in this job sheet. Answer any questions, then have students complete this activity. **(Reading/listening for content; orally communicating a thought)**

Objective 4 Use a tax table.

- Demonstrate the use of a tax table. Answer any questions, then give students the opportunity to figure sales tax for the dollar amounts you give them. **(Listening for content; orally communicating a thought; math)**

Suggested Activities

Objective 5 Select true statements concerning procedures for counting change.

- Demonstrate the proper procedure for counting change. Hand out Assignment Sheet 1 "Count Change". Read and discuss the introduction and directions, then have students complete the assignment. **(Listening for content; math)**

Objective 6 List information needed to complete a sales ticket or invoice.

- Use blank sales slips and Transparencies 2 and 3 to lead the class through completing a sales ticket, explaining the importance of each entry. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation)**
- Hand out Assignment Sheet 2 "Complete a Sales Ticket." Read and discuss the introduction and directions, then have students complete the assignment. **(Reading/listening for content; applying technical terms)**

Objective 7 Select true statements concerning the procedure for accepting checks.

- Outline how a checking account works, and lead the class through a step-by-step explanation of what the numbers and symbols found on checks represent. **(Listening for content)**
- Provide examples of different kinds of blank checks, checks that contain errors, and checks with obvious tampering (amounts, dates, etc.) Lead the class in a discussion of what can and does occur in check fraud. **(Listening for content; applying technical terms; orally communicating a thought or idea)**
- Hand out Assignment Sheet 3 "Accept Checks." Read and discuss the introduction and directions, then have students complete the assignment. **(Reading/listening for content)**

Suggested Activities

Objective 8 Select true statements concerning the procedure for accepting credit cards.

- Discuss with the class how credit card accounts work. Emphasize the use of the magnetic strip on the back of the credit card and how it contains electronically coded information about the bank account and credit card holder. Ask the class to give examples of the number of different ways a credit card can be used (purchases by phone, by point-of-purchase scanner, manual credit card imprinter, telephone calls, etc.). **(Listening for content; applying technical terms; adapting to an organization's traditional modes of operation; orally communicating a thought)**

- Hand out Job Sheet 1 "Process a Credit Card Sale." Read and discuss directions and evaluation criteria with students. Demonstrate the proper procedure for handling a credit card sale. Show students how a credit card imprinter works. Give students an opportunity to practice using the imprinter. Answer any questions, then have students complete this activity. **(Listening for content; orally communicating a thought; adapting to the organization's traditional modes of operation)**

Objective 9 List two special precautions for handling money orders.

- Explain to the class how money orders work and why they are preferable to cash for mailing relatively small sums of money. Distribute examples of money orders to class members and instruct them in filling out the money orders. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation)**

Objective 10 List two special precautions for handling travelers checks.

- Explain to the class how travelers checks work and why they are preferable to cash for travelers. Distribute examples of travelers checks to class members and instruct them in cashing/accepting a travelers check. **(Listening for content; reasoning; adapting to the organization's traditional modes of operation)**

Suggested Activities

Objective 11 Select true statements concerning handling exchange items and cores. **Objective 12** Select true statements concerning handling defective items. **Objective 13** Solve problems concerning the procedure for making a refund.

- Use Transparencies 4 through 7 to discuss with students items to check for on cores. Explain the importance of checking parts to determine trade-in value or allowance on the part. **(Listening for content; applying technical terms; adapting to the organization's traditional modes of operation)**
- Discuss with the class the remanufacturing processes and the importance of this industry to the parts business. Have class members examine a typical "core" of brake shoes or a filthy malfunctioning fuel pump, and then allow them to examine the same parts being sold as remanufactured items. **(Listening for content; reasoning; applying technical terms)**
- Discuss the warranty involved on the new parts and compare the price of the "reman" parts with the price of a new item of similar specifications. **(Listening for content; applying technical terms)**
- Show Transparencies 8 and 9 and emphasize the importance of tagging defective parts and completing the necessary paperwork. **(Listening for content; applying technical terms; adapting to the organization's traditional modes of operation)**
- Arrange for a local parts store manager to discuss with the class the store's return policy or have class call local parts stores and ask about their return policy. **(Listening for content; orally communicating a thought; applying technical terms)**
- Using sales slips and various parts at your disposal, organize class into teams to role play the return scenario in which a customer brings back a part and asks for a refund. Oversee the class to emphasize the "class" policy on returns, and to ensure students understand what information is needed for proper refunds, etc. **(Listening for content; orally communicating a thought; applying technical terms; adapting to the organization's traditional modes of operation)**

Suggested Activities

- Hand out Assignment Sheet 4 "Complete a Credit Memo." Read and discuss the introduction and directions, then have the students complete the assignment. **(Reading/listening for content)**
- Hand out Job Sheet 2 "Make a Refund." Read and discuss directions and evaluation criteria with students. Demonstrate how to make a refund using the procedure outlined in the job sheet. Answer any questions, then have students complete this activity. **(Reading/listening for content; math; reasoning)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet and the component "Answers to Assignment Sheets."
- Evaluate job sheets. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job-sheet scores on "Unit Evaluation Form."
- Reteach and retest as required.

Suggested Resources

Resources Used in Developing This Unit

- *Automotive Wholesaler Counterman's Handbook*. Chicago, IL: Automotive Service Industry Association.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management*. Albany, NY: Delmar Publishers Inc., 1989.
- Notgrass, Troy. *Auto Parts Counter Worker*. Austin, TX: Instructional Materials Center, University of Texas.
- Nelson, Frank W. *Distributive Education II*. Stillwater, OK 74074: Curriculum and Instructional Materials Center, Oklahoma State Department of Vocational and Technical Education.
- Stull, William. *Marketing Math*. Cincinnati, OH: South-Western Publishing Co.

Suggested Activities

- Sumpter, Tom. *Basic Auto Parts Training*. Fairview, OR: 1980.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.
- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Sales Policies and Procedures
Unit 13

Answers to Assignment Sheets

Assignment Sheet 1

Sales No.	Amount of sale	Amount Rec'd	Coins					Bills			
			1¢	5¢	10¢	25¢	50¢	$1	$5	$10	$20
1	$12.33	$20.00	2	1	1		1	2	1		
2	$ 7.88	$20.00	2		2			2		1	
3	$23.07	$40.00	3	1	1	1	1	1	1	1	
4	$ 3.00	$50.00						2	1		2
5	$ 7.14	$20.00	1		1	1	1	2		1	
6	$ 8.12	$10.00	3		1	1	1	1			
7	$ .78	$10.00	2		2		4		1		

Assignment Sheet 2

ORIGINAL

AUTOMOTIVE SUPPLY INC.

OK · 0008
INVOICE NO.

Sold To Danita Hill

Phone:

PURCHASE ORDER NUMBER

CASH

CHARGE

CHECK

ACCOUNT NO.

DATE

STOCK	QTY	NUMBER	DESCRIPTION	MFR	PRICE	NET	TOTAL	
A-31	2	6401	Headlights		9.00		18	00
B-12	1	35508	Alternator Belt		12.95		12	95
C-9	3	65-1	DOT 3 Brake Fluid		3.98		11	94
							42	89

Electrical Items or Parts Not Returnable [illegible] Invoice Must Accompany Returned Goods

[illegible] Handling Fee After 5 Days [illegible] Interest Per Month Over Due Accounts

TAX & ETC. 3.01

SALESPERSON	LABOR	TRANS	TELE	TAX
John				

TOTAL $ $45.90

RECEIVED BY

CUSTOMER SIGNATURE

Answers to Assignment Sheets

Assignment Sheet 3

1. a. Many businesses will not accept checks over thirty days old.
   b. Corrections without the initials of the person writing the check.
   c. Number amount and written amount are different.
   d. Signature is not the same as name printed on check.

2. a. Post-dated checks may not be cashed until that date arrives.
   b. No address on check; if it is not printed on the check it should be written in.

Assignment Sheet 4

Answer to question: No, because she charged the carburetor when she originally bought it, so you would not give her cash back.

ORIGINAL

AUTOMOTIVE SUPPLY INC.

OK 0008
INVOICE NO.

Sold To Jones Chevrolet
100 Main Street
Dallas, Texas 76200
Phone (512) 555-1672
Reason for Return Defective Carburetor

PURCHASE ORDER NUMBER	
CASH	CHARGE ✓
CHECK	ACCOUNT NO 00571
DATE 9-1-94	

STOCK	QTY	NUMBER	DESCRIPTION	PRICE	NET	TOTAL
	1	2261	Carburetor	125.00	90.00	90 00

CREDIT MEMO

Electrical Items or Parts Not Returnable *** Invoice Must Accompany Returned Goods

[illegible] Fee After 5 Days *** [illegible] Interest Per Month On Past Due Accounts

SALESPERSON	LABOR	TRANS	TELE	TAX
George W.				

TAX & ETC.	resale
TOTAL $	90.00

ISSUED BY Ramona Juarez

CUSTOMER SIGNATURE Cybil Jones

Sales Policies and Procedures
Unit 13

Answers to Written Test

1. a. 6
   b. 13
   c. 12
   d. 11
   e. 4
   f. 9
   g. 10
   h. 2
   i. 18
   j. 15
   k. 8
   l. 1
   m. 7
   n. 5
   o. 3
   p. 14
   q. 17
   r. 16

2. a. 5
   b. 7
   c. 3
   d. 2
   e. 1
   f. 4
   g. 6

3. a. Computer
   b. Cash register
   c. Electronic calculator
   d. FAX machine

4. a. $1.75
   b. $9.45
   c. $27.09
   d. $92.68
   e. $3.50
   f. $45.47
   g. $6.49
   h. $3.16
   i. $161.12
   j. $15.25

5. a. 2, 3, 5, 6
   b. 1

6. Answers may include any eight of the following:

   a. Who is purchasing item
   b. How ticket is to be paid
   c. Date of purchase
   d. Quantity of items purchased
   e. Part numbers
   f. Name of manufacturer and article
   g. List price
   h. Net price
   i. Total price of all parts
   j. Core charge or any other adjustments
   k. Sales tax if applicable
   l. Parts specialist's signature or initials
   m. "Cash" or "charge" stamped on invoice
   n. Customer signature on invoice if it is a charge

7. a, c, e, f, g, i, k, l, n, o

Answers to Written Test

8. a, c, d

9. a. Do not cash if the amount has been altered, erased, or if the amount is in excess of the printed limit.
   b. Notice the dates and signatures as carefully as if it were a regular check.

10. a. Have customer sign check in your presence.
    b. Compare the customer's signature with the signature on the front of the check made at the time the checks were purchased at the bank.

11. b, c, e

12. b, d

13. Answer may be in student's own words but should include the following:

    a. Ask for original sales receipt to determine if the part or item was purchased at store and to determine the price paid for the item.
    b. Inspect the returned item to make sure it is in the right box and no parts are missing or damaged.
    c. Complete a cash refund ticket or credit memo if parts are complete and in good condition.
    d. Return amount of refund to customer if cash was paid.
    e. Complete a "paid out" slip to show that a cash refund was made and place it in cash drawer.
    f. Return item(s) to stock.

Sales Policies and Procedures
Unit 13

Written Test

Name ______________________________ Score ______________

1. Match terms related to sales policies and procedures with their correct definitions. Write the numbers on the blanks provided. Definitions continue on next page.

_____a. A nominal charge for processing an item for return through the normal channels of a manufacturer or supplier

_____b. Money given back to a customer upon return of merchandise or for an overcharge on a sale

_____c. A formal request from the buyer to the seller which specifies the conditions of sale and delivery

_____d. Dating a check for a date later than when the check is written

_____e. Indicates the terms of payment are computed from the end of the month in which the purchase is made

_____f. An ongoing account for a customer with good credit who makes frequent purchases and is therefore allowed to charge as needed and pay in one lump sum at the end of each month

_____g. Money spent by the firm; usually used in connection with cash register transactions

_____h. A ticket used to give credit or refund to a customer when merchandise is returned

_____i. A guarantee from manufacturer to seller that the product will perform to specifications for a certain use period

1. Core
2. Credit memo
3. Endorsement
4. E.O.M. (End of Month)
5. Extending prices
6. Handling charge
7. Money order
8. Net 30
9. Open account
10. Paid out
11. Post dating
12. Purchase order
13. Refund
14. Sales tax
15. Sales ticket
16. Stock order
17. Travelers check
18. Warranty

Written Test

______j. A ticket which states the date, customer's name, quantity, part number, description, price of items sold, and method of payment

______k. The invoice must be paid not later than 30 days from the date of the invoice

______l. Used item accepted in exchange; it is either remanufactured or reconditioned so it can be resold

______m. Order issued by various vendors such as a post office, bank, or telegraph office for payment of money

______n. Showing the list price, net, or customer's price, the customer's price times the quantity sold, the subtotal of items purchased, tax, and the invoice total

______o. Signature placed on the back of a check by the person cashing it

______p. A certain percent of the total bill

______q. Check guaranteed by deposits at bank which issues the check; may be replaced if stolen; has to be signed at bank and again in front of person who cashes it

______r. A purchase order regularly issued by a wholesaler to bring stock up to the desired level

Written Test

2. Match terms related to pricing with their correct definitions. Write the numbers on the blanks provided.

_____a. The cost of an item usually determined by the class of the purchaser

_____b. A reduction offered to customers who will use a particular item for resale or to make repairs

_____c. Difference between cost of an item and retail price

_____d. Suggested retail price

_____e. A special reduction made from list price for certain customers; usually those who buy in large quantities and pay promptly

_____f. Pricing in terms of quantities of more than one unit

_____g. A reduction given to encourage customers to buy in large quantities

1. Discount
2. List price
3. Mark-up
4. Multiple pricing
5. Net price
6. Quantity discount
7. Trade discount

3. List office machines commonly used in a parts store.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

Written Test

4. Use the following tax table to figure sales tax for the amounts given below.

7%

4.5% State Sales Tax
+ 2.5% City/County Tax

Sales Up To	Tax	Sales Up To	Tax	Sales Up To	Tax	Sales Up To	Tax
$0.07	0.00	2.64	0.18	5.21	0.36	7.78	0.54
0.21	0.01	2.78	0.19	5.35	0.37	7.92	0.55
0.35	0.02	2.92	0.20	5.49	0.38	8.07	0.56
0.49	0.03	3.07	0.21	5.64	0.39	8.21	0.57
0.64	0.04	3.21	0.22	5.78	0.40	8.35	0.58
0.78	0.05	3.35	0.23	5.92	0.41	8.49	0.59
0.92	0.06	3.49	0.24	6.07	0.42	8.64	0.60
1.07	0.07	3.64	0.25	6.21	0.43	8.78	0.61
1.21	0.08	3.78	0.26	6.35	0.44	8.92	0.62
1.35	0.09	3.92	0.27	6.49	0.45	9.07	0.63
1.49	0.10	4.07	0.28	6.64	0.46	9.21	0.64
1.64	0.11	4.21	0.29	6.78	0.47	9.35	0.65
1.78	0.12	4.35	0.30	6.92	0.48	9.49	0.66
1.92	0.13	4.49	0.31	7.07	0.49	9.64	0.67
2.07	0.14	4.64	0.32	7.21	0.50	9.78	0.68
2.21	0.15	4.78	0.33	7.35	0.51	9.92	0.69
2.35	0.16	4.92	0.34	7.49	0.52		
2.49	0.17	5.07	0.35	7.64	0.53		

Sales Over $10.00

Amount	Tax	Amount	Tax
$ 10.00	0.70	$ 60.00	4.20
$ 20.00	1.40	$ 70.00	4.90
$ 30.00	2.10	$ 80.00	5.60
$ 40.00	2.80	$ 90.00	6.30
$ 50.00	3.50	$100.00	7.00

How To Figure the Tax:

Example: Sale is $55.43

Tax on $50.00	$3.50
Tax on $ 5.43	0.38
Total Tax	$3.88

a. $25.00 ____________

b. $135.00 ____________

c. $387.00 ____________

d. $1,324.00 ____________

e. $50.00 ____________

f. $649.50 ____________

g. $92.75 ____________

h. $45.10 ____________

i. $2,301.65 ____________

j. $217.80 ____________

Written Test

5. Select true statements concerning procedures for counting change. Place an "X" beside each true statement.

   a. Without an automatic change dispenser:

      _____ 1. Place the money received in the cash register while making change.

      _____ 2. Make change with the least number of coins and bills.

      _____ 3. Repeat the amount of the sale and the amount of money received by the customer.

      _____ 4. Count the money to yourself as it is taken from the cash drawer to avoid counting it back to the customer.

      _____ 5. Subtract any additional change given by the customer and begin counting back from that amount.

      _____ 6. Count the change directly into the customer's hand whenever possible.

   b. With an automatic change dispenser:

      _____ 1. Record both the amount of the sale and the amount received on the cash register or change-making machine.

      _____ 2. It is not necessary to state the amount of change when the amount is indicated on the machine.

      _____ 3. Count the change to the customer starting with the smallest coins and ending with the largest bills.

6. List eight items of information needed to complete a sales ticket or invoice.

   a. ______________________________

   b. ______________________________

   c. ______________________________

   d. ______________________________

   e. ______________________________

Written Test

f. ______________________________

g. ______________________________

h. ______________________________

7. Select true statements concerning the procedure for accepting checks by placing an "X" in the appropriate blanks.

______a. Post-dated checks may not be cashed until that date arrives.

______b. Most businesses will accept checks over thirty days old.

______c. The amount needs to be written clearly in numbers and words.

______d. If the amount written in words is different from the amount written in numbers, the bank will not accept the check.

______e. The customer needs to initial any corrections on the dates or amounts.

______f. Write in customer's address if none is shown or if only a post office box is printed on the check face.

______g. Observe store rules for getting checks approved, limits on the amount of the check, and on accepting two-party, out-of-town, or company payroll checks.

______h. Asking for proper identification is not necessary.

______i. Make sure the signature on the identification matches the signature on the check.

______j. The written signature does not have to be the same as the printed name on the check.

______k. Do not accept checks written in pencil.

______l. Do not accept checks marked "For Deposit Only".

______m. You may accept company checks with the company name typed on the face of the check rather than printed on the face of the check.

______n. Do not accept checks without an account number or with altered account numbers.

______o. Verify with your supervisor all questionable checks.

Written Test

8. Select true statements concerning the procedure for accepting credit cards by placing an "X" in the appropriate blanks.

______a. Make sure the card is one your business accepts.

______b. Expiration dates are not important and therefore should be ignored.

______c. Make sure the signature on the receipt matches the signature on the card.

______d. Check the credit card number with the warning list of bad, lost, or stolen cards.

______e. It is not necessary to contact the credit company for authorization if suspicion arises.

9. List special precautions for handling money orders.

a. ____

____

b. ____

____

10. List two special precautions for handling travelers checks.

a. ____

____

b. ____

____

11. Select true statements concerning handling exchange items and cores by placing an "X" in the appropriate blanks.

______a. Parts houses very often sell remanufactured parts that are more expensive than new parts.

______b. When a customer buys a remanufactured unit, the core is taken in by the parts person as a trade-in or allowance on the remanufactured unit.

______c. Cores must be inspected for identification, completeness, and acceptable condition before credit is given to the customer.

Written Test

______d. If a core has missing parts or is slightly damaged, it can still be taken in to be rebuilt.

______e. When you take in a core you should tag it properly and put it with other cores to be picked up.

12. Select true statements concerning handling defective items by placing an "X" in the appropriate blanks.

______a. A warranty is always given in writing.

______b. Notice of the availability of written consumer warranty information should be posted within the customer's view.

______c. It is not important to get all the facts on a faulty part.

______d. It is important to do paper work on defective items as soon as possible.

13. Explain, in writing, the procedure for making a refund.

____

____

____

____

____

____

____

***Permission to duplicate this test is granted.**

Sales Policies and Procedures
Unit 13

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Count Change Rating ______

Comments: ____

____

Assignment Sheet 2—Complete a Sales Ticket Rating ______

Comments: ____

____

Assignment Sheet 3—Accept Checks Rating ______

Comments: ____

____

Assignment Sheet 4—Complete a Credit Memo Rating ______

Comments: ____

____

Job Sheet 1—Process a Credit Card Sale Rating ______

Comments: ____

____

Job Sheet 2—Make a Refund Rating ______

Comments: ____

____

Unit Evaluation Form

Job Sheet 3—Send and Verify Receipt of a FAX Message

Rating ______

Comments: ____

____

Written-Test Scores

Pretest ______ Posttest ______ Other ______

Other ____

____

Teacher Signature ______________________ Date ____________

Student Signature ______________________ Date ____________

*Permission to duplicate this form is granted.

Typical Cash-Tray Setup

$100

$50	$20	$10	$5	$1
$.50	$.25	$.10	$.05	$.01

Information Needed on a Cash Sales Ticket

ORIGINAL

AUTOMOTIVE SUPPLY INC.

OK 00093
INVOICE NO.

Sold To John Doe

Phone

PURCHASE ORDER NUMBER	
CASH ✓	CHARGE
CHECK	ACCOUNT NO
DATE 9-18-94	

STOCK	QTY	NUMBER	DESCRIPTION	MFR.	PRICE	NET	TOTAL	
A12	1	OR-60	Distributor cap	HL	4.25		4	25
B6	8	ARF52	Spark plugs	AC	1.00		8	00
E5	1	FL1	Oil filter	MP	3.50		3	50
C10	5	qts.	30w oil	PZ	1.10		5	50
							21	25

The use of bin and shelf identification varies with store policies.

Electrical Items or Parts Not Returnable **** Invoice Must Accompany Returned Goods

10% Handling Fee After 5 Days **** [illegible] Interest Per Month On Past Due Accounts

SALESPERSON	LABOR	TRANS	TELE	TAX
Bob				

TAX & ETC.	1.06
TOTAL $	22.31

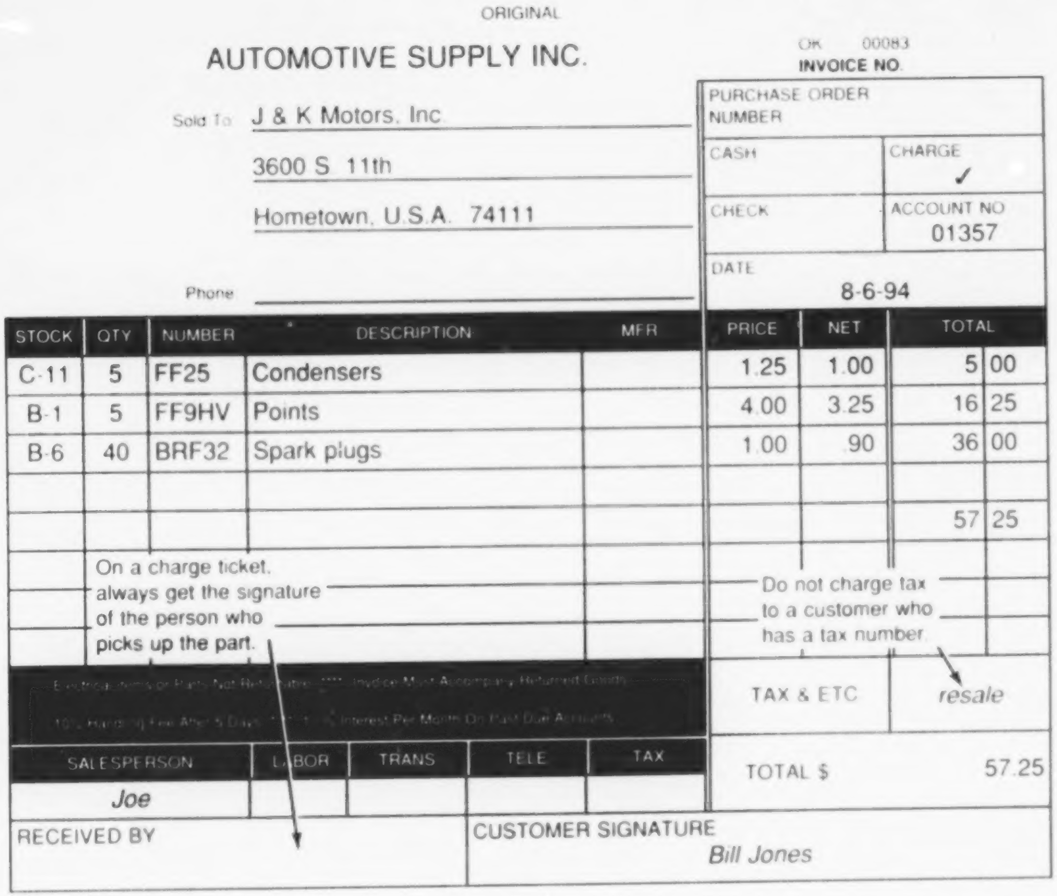
RECEIVED BY

CUSTOMER SIGNATURE

Parts Specialist, Unit 13
Teacher Page 25

TM 2

Information Needed on a Charge Sales Ticket



ORIGINAL

AUTOMOTIVE SUPPLY INC.

OK 00083
INVOICE NO.

Sold To J & K Motors, Inc.
3600 S 11th
Hometown, U.S.A. 74111

Phone

PURCHASE ORDER NUMBER

CASH
CHARGE ✓
CHECK
ACCOUNT NO 01357
DATE 8-6-94

STOCK	QTY	NUMBER	DESCRIPTION	MFR	PRICE	NET	TOTAL
C-11	5	FF25	Condensers		1.25	1.00	5 00
B-1	5	FF9HV	Points		4.00	3.25	16 25
B-6	40	BRF32	Spark plugs		1.00	.90	36 00
							57 25

On a charge ticket, always get the signature of the person who picks up the part.

Do not charge tax to a customer who has a tax number.

TAX & ETC resale

TOTAL $ 57.25

SALESPERSON	LABOR	TRANS	TELE	TAX
Joe				

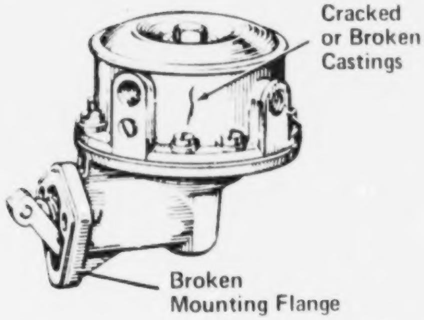
RECEIVED BY

CUSTOMER SIGNATURE
Bill Jones

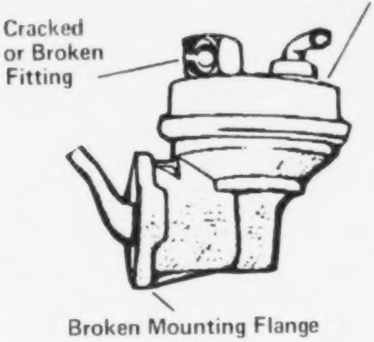
Items to Check for on Cores

Fuel Pumps

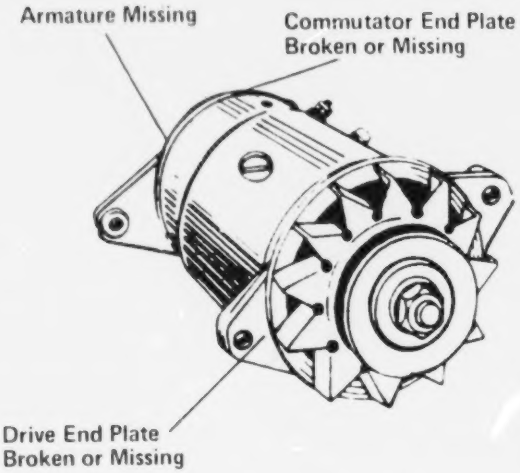
DIE CAST PUMP


Cracked or Broken Castings
Broken Mounting Flange

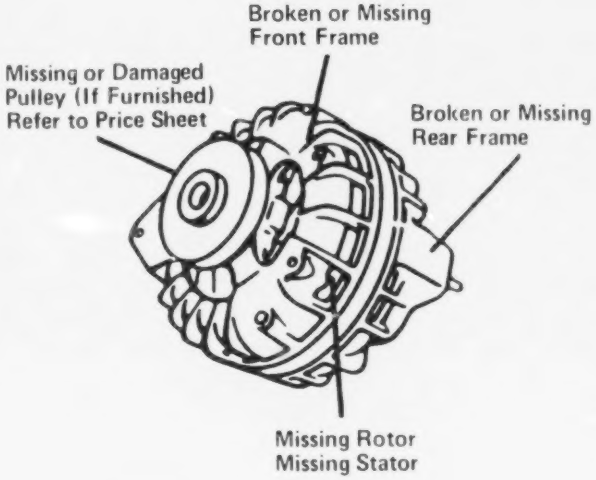
UNITAC PUMP


Bent or Broken Top
Cracked or Broken Fitting
Broken Mounting Flange

Generators


Armature Missing
Commutator End Plate Broken or Missing
Drive End Plate Broken or Missing

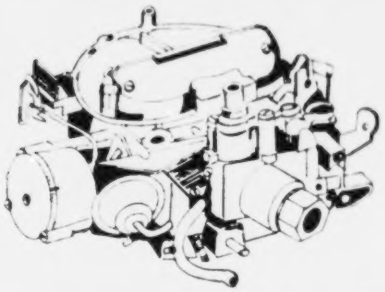
Alternators


Broken or Missing Front Frame
Missing or Damaged Pulley (If Furnished) Refer to Price Sheet
Broken or Missing Rear Frame
Missing Rotor
Missing Stator

Items to Check for on Cores
(Continued)

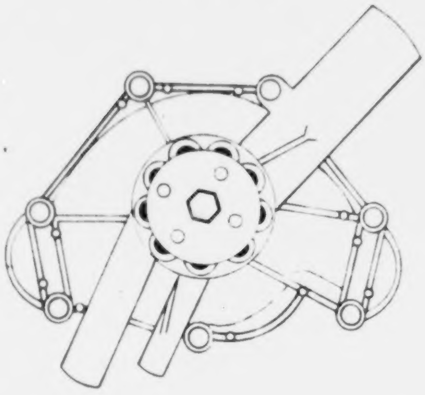
Carburetors

CHARGES FOR BROKEN OR MISSING PARTS WILL BE MADE FOR THE FOLLOWING
(Refer to Carburetor Price Sheet for Specific Charges)



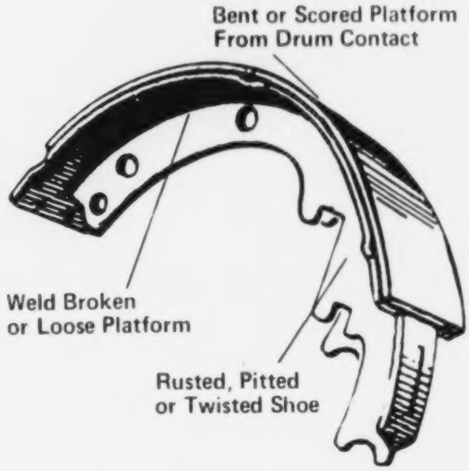
1. Frozen, Cracked or Disassembled Units
2. Burned or Excessively Oxidized
3. Broken Air Horn
4. Body
5. Base
6. Automatic Choke
7. Stripped Threads

Water Pumps



Cracked or Broken Castings
Excessively Pitted Aluminum Castings
Bolt Hole Broken Off

Brake Shoes


Bent or Scored Platform From Drum Contact
Weld Broken or Loose Platform
Rusted, Pitted or Twisted Shoe

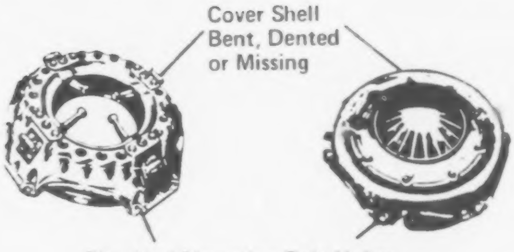
Items to Check for on Cores

(Continued)

Pressure Plate

LEVER TYPE

DIAPHRAGM TYPE


Cover Shell
Bent, Dented
or Missing
Flywheel Mounting Bolt Holes
Torn or Excessively out of Round

Clutch Disc

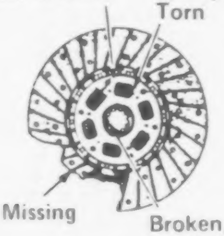
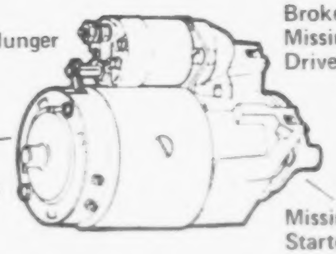


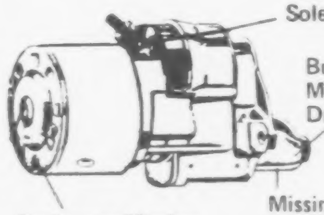
Plate Cracked
Spring Pockets
Torn
Fins Missing
Broken, Loose
or Missing Hub

Starters

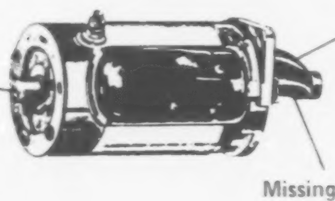
DELCO TYPE


Missing Plunger
Broken or
Missing
Drive Housing
Broken
or
Missing
Brush Plate
Missing
Starter Drive

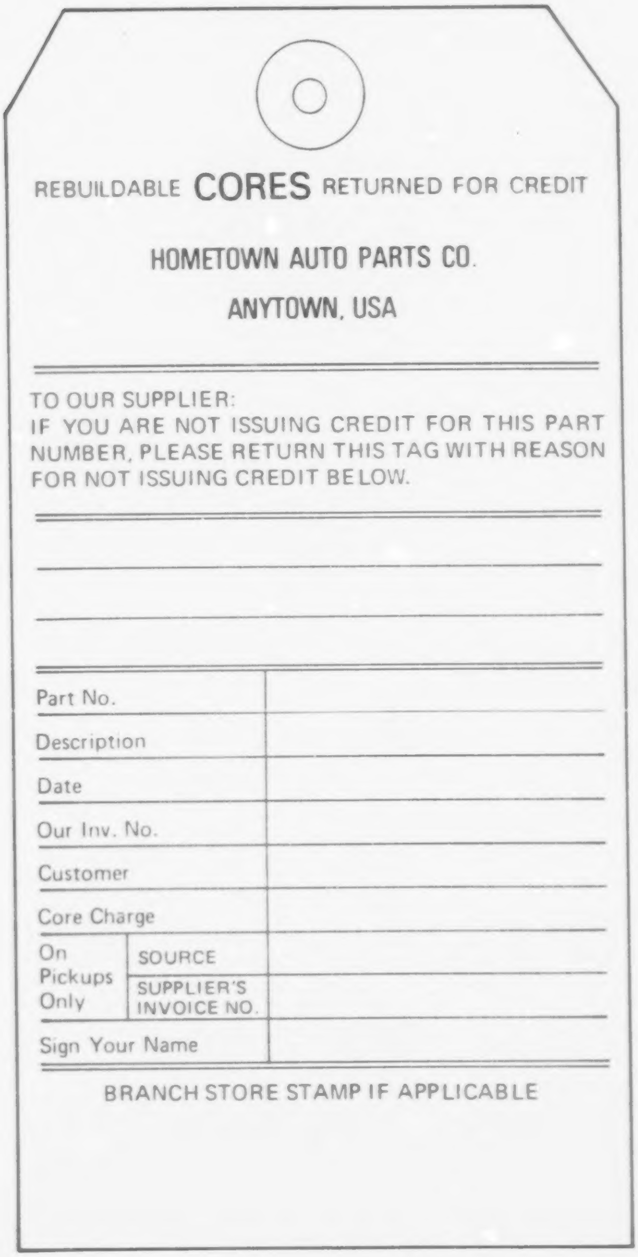
CHRYSLER TYPE


Broken or
Missing
Solenoid
Broken or
Missing
Drive Housing
Broken or Missing
Brush Plate
Missing
Starter Drive

FORD TYPE


Broken
or Missing
Drive Housing
Broken
or Missing
Brush Plate
Missing Starter Drive

Core Tag



REBUILDABLE **CORES** RETURNED FOR CREDIT

HOMETOWN AUTO PARTS CO.

ANYTOWN, USA

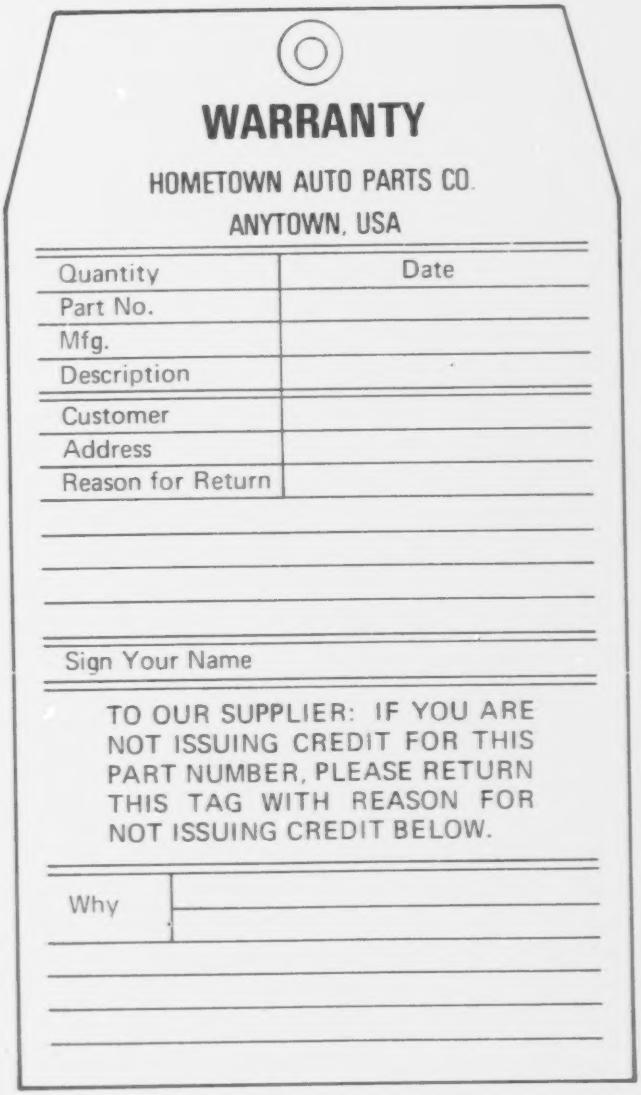
TO OUR SUPPLIER:
IF YOU ARE NOT ISSUING CREDIT FOR THIS PART NUMBER, PLEASE RETURN THIS TAG WITH REASON FOR NOT ISSUING CREDIT BELOW.

Part No.		
Description		
Date		
Our Inv. No.		
Customer		
Core Charge		
On Pickups Only	SOURCE	
	SUPPLIER'S INVOICE NO.	
Sign Your Name		

BRANCH STORE STAMP IF APPLICABLE

847

Warranty Tag



WARRANTY

HOMETOWN AUTO PARTS CO.
ANYTOWN, USA

Quantity	Date
Part No.	
Mfg.	
Description	
Customer	
Address	
Reason for Return	

Sign Your Name

TO OUR SUPPLIER: IF YOU ARE NOT ISSUING CREDIT FOR THIS PART NUMBER, PLEASE RETURN THIS TAG WITH REASON FOR NOT ISSUING CREDIT BELOW.

Why

Merchandise Return Form

AUTOMOTIVE SUPPLY INC.

DATE

CREDIT NO.

APPROVED BY

JOBBER & CLASSIFICATION STOCK RETURN

STORE NAME

JOBBER NO.

DO NOT RETURN ANY MERCHANDISE FOR CREDIT UNTIL AUTHORIZATION IS MADE BY THE DISTRIBUTION CENTER

CLASS	QUANTITY			LINE NO.	PART NO.	INVOICE NO.	WARRANTY TAG NO.	CODE
	TO KEEP	TO RETURN	ACTUAL SHIPPED					

Parts Specialist, Unit 13
Teacher Page 39

TM 9

849

850

Sales Policies and Procedures
Unit 13

Information Sheet

1. **Terms and definitions related to sales policies and procedures**

   a. **Core** — Used item accepted in exchange; it is either remanufactured or reconditioned so it can be resold

   b. **Credit memo** — A ticket used to give credit or refund to a customer when merchandise is returned

   c. **Endorsement** — Signature placed on the back of a check by the person cashing it

   d. **E.O.M. (End of Month)** — Indicates the terms of payment are computed from the end of the month in which the purchase is made

   e. **Extending prices** — Showing the list price, net, or customer's price, the customer's price times the quantity sold, the subtotal of items purchased, tax, and the invoice total

   f. **Handling charge** — A nominal charge for processing an item for return through the normal channels of a manufacturer or supplier

   g. **Money order** — Order issued by various vendors such as a post office, bank, or telegraph office for payment of money

   h. **Net 30** — The invoice must be paid not later than 30 days from the date of the invoice

   i. **Open account** — An ongoing account for a customer with good credit who makes frequent purchases and is therefore allowed to charge as needed and pay in one lump sum at the end of each month

   Note: Parts specialists should be familiar with open accounts that have been approved by management. Examples include: car dealerships, independent garages, and vocational schools.

   j. **Paid out** — Money spent by the firm; usually used in connection with cash register transactions

   k. **Post dating** — Dating a check for a date later than when the check is written

   Note: Check with the manager before accepting a post-dated check.

   l. **Purchase order** — A formal request from the buyer to the seller which specifies the conditions of sale and delivery

Information Sheet

m. **Refund** — Money given back to a customer upon return of merchandise or for an overcharge on a sale

n. **Sales tax** — A certain percent of the total bill

o. **Sales ticket (Invoice)** — A ticket which states the date, customer's name, quantity, part number, description, price of items sold, and method of payment

p. **Stock order** — A purchase order regularly issued by a wholesaler to bring stock up to the desired level

q. **Travelers check** — Check guaranteed by deposits at bank which issues the check; may be replaced if stolen; has to be signed at bank and again in front of person who cashes it

r. **Warranty** — A guarantee from manufacturer to seller that the product will perform to specifications for a certain use period

Note: Warranties may be based on a length of time in service or a number of miles or hours in service. Many times warranties carry certain stipulations for the type of service they will protect. For instance, many auto parts are warranted for 90 days or 3,000 miles, which ever comes first. However, if that same part is used for off-road use, or racing, there is no warranty. So, because warranties differ, it is vital for the seller and buyer to understand what the specific warranty is, and how it applies.

2. **Terms and definitions related to pricing**

a. **Discount** — A special reduction made from list price for certain customers; usually those who buy in large quantities and pay promptly

b. **List price** — Suggested retail price

c. **Mark-up** — Difference between cost of an item and retail price

d. **Multiple pricing** — Pricing in terms of quantities of more than one unit

Example: Customer may purchase one can for 25 cents, or with multiple pricing, five cans for $1.00.

e. **Net price** — The cost of an item usually determined by the class of the purchaser

Example: Dealer net, distributor net, jobber net

f. **Quantity discount** — A reduction given to encourage customers to buy in large quantities

Information Sheet

g. **Trade discount** — A reduction offered to customers who will use a particular item for resale or to make repairs

Note: A trade discount may be given in a lump sum, like 40% off or it may be in a series of discounts like less 25%, less 10%.

Example:

Lump Sum

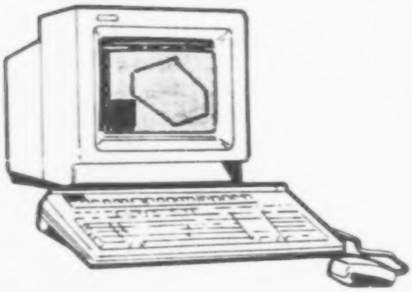
Parts total	$1,000.00
Less 40%	400.00
Customer owes	600.00

Series

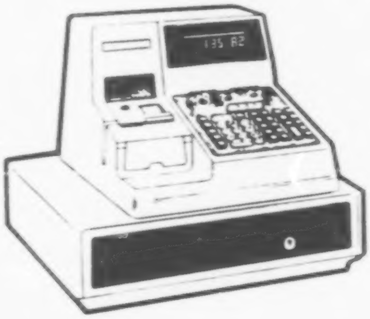
Parts total	$1,000.00
Less 25%	250.00
	750.00
Less 10%	75.00
Customer owes	675.00

3. **Office machines commonly used in a parts store**

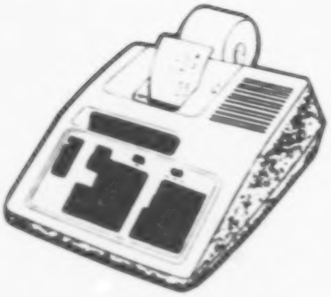
a. Computer



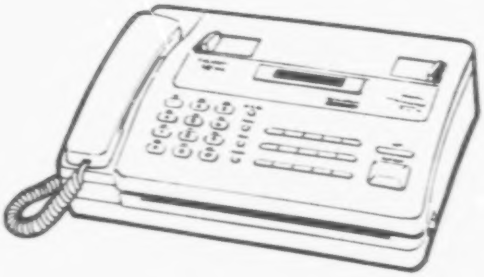
b. Cash register



c. Electronic calculator



d. FAX machine



Information Sheet

4. Steps in using a tax table

a. Total the customer's bill.

b. Find the amount of tax due by looking at a tax table.

Note: The amount of tax to charge is in the right column of each box.

7%

4.5% State Sales Tax
+ 2.5% City/County Tax

Sales Up To	Tax	Sales Up To	Tax	Sales Up To	Tax	Sales Up To	Tax
$0.07	0.00	2.64	0.18	5.21	0.36	7.78	0.54
0.21	0.01	2.78	0.19	5.35	0.37	7.92	0.55
0.35	0.02	2.92	0.20	5.49	0.38	8.07	0.56
0.49	0.03	3.07	0.21	5.64	0.39	8.21	0.57
0.64	0.04	3.21	0.22	5.78	0.40	8.35	0.58
0.78	0.05	3.35	0.23	5.92	0.41	8.49	0.59
0.92	0.06	3.49	0.24	6.07	0.42	8.64	0.60
1.07	0.07	3.64	0.25	6.21	0.43	8.78	0.61
1.21	0.08	3.78	0.26	6.35	0.44	8.92	0.62
1.35	0.09	3.92	0.27	6.49	0.45	9.07	0.63
1.49	0.10	4.07	0.28	6.64	0.46	9.21	0.64
1.64	0.11	4.21	0.29	6.78	0.47	9.35	0.65
1.78	0.12	4.35	0.30	6.92	0.48	9.49	0.66
1.92	0.13	4.49	0.31	7.07	0.49	9.64	0.67
2.07	0.14	4.64	0.32	7.21	0.50	9.78	0.68
2.21	0.15	4.78	0.33	7.35	0.51	9.92	0.69
2.35	0.16	4.92	0.34	7.49	0.52		
2.49	0.17	5.07	0.35	7.64	0.53		

Sales Over $10.00

Amount	Tax	Amount	Tax
$ 10.00	0.70	$ 60.00	4.20
$ 20.00	1.40	$ 70.00	4.90
$ 30.00	2.10	$ 80.00	5.60
$ 40.00	2.80	$ 90.00	6.30
$ 50.00	3.50	$100.00	7.00

How To Figure the Tax:

Example: Sale is $55.43

Tax on $50.00	$3.50
Tax on $ 5.43	0.38
Total Tax	$3.88

c. Add the amount of tax due to the subtotal to get the total.

Example:

Subtotal	—	$65.52
Sales tax	—	$ 4.58
Total	—	$70.10

Information Sheet

5. Procedures for counting change

a. Without an automatic change dispenser:

- Place the money received on the coin slab while making change.
- Make change with the least number of coins and bills.

  Example: Instead of two dimes and a nickel, give the customer a quarter; instead of seven ones, give the customer a five dollar bill and a two dollar bill or a five dollar bill and two ones.

- Repeat the amount of the sale and the amount of money received by the customer.
- Count the money to yourself as it is taken from the cash drawer and then again back to the customer.
- Do not add or subtract, simply begin with the smallest amount and count back to the amount given by the customer.

  Example: If the customer owes $2.87 and gives you a ten dollar bill you would say, "That will be two eighty-seven out of ten. Two eighty-seven, two eighty-eight, two eighty-nine, two ninety, three dollars, four, five and five dollars makes ten. Thank you."

- Mention each new dollar denomination throughout to avoid making mistakes.

  Example: "That will be two eighty-seven out of ten. Two eighty-seven, two eighty-eight, two eighty-nine, two ninety, three dollars, four, five and five dollars makes ten. Thank you."

- Count each coin and bill separately.

  Example: Dot not lump all pennies together but count each one separately. Lumping change together does not save time because most customers will take time to count the change anyway.

Information Sheet

- Subtract any additional change given by the customer and begin counting back from that amount.

  Example: If the customer owes $2.87 and gives you $5.87, you would count back by saying, "Two dollars, three, four and five dollars." If the customer owes $2.35 and gives you $5.50, you would reply, "Thirty-five cents out of fifty cents—thirty-five, forty-five, fifty, and two dollars out of five—two dollars, three, four, and five dollars. Thank you."

- Start over if interrupted or politely ask the customer to wait until the transaction is completed.

- Count the change directly into the customer's hand whenever possible.

- Never argue or accuse a customer of cheating.

- Cash checks for other than the exact amount before receiving payment for goods and services.

b. With an automatic change dispenser:

- Record both the amount of the sale and the amount received on the cash register or change-making machine.

- Repeat the amount of the purchase and the amount of money received when the money is placed on the coin slab and again as the amount of money received is punched into the machine.

  Example: "$21.50 out of $30.00."

- State the amount of change when the amount is indicated on the machine.

  Example: "Your correct change is $8.50."

- Take the number of bills and then the amount of change from the cash drawer.

  Note: Some machines dispense the coins automatically. Thus, the customer picks up his/her coins without having them counted back. The cashier should remind the customer to pick up his/her change.

Information Sheet

- Count the change to the customer starting with the largest bills and ending with the smallest coins.

  Example: "Your change will be $8.50. Five dollars, six, seven, and eight dollars. And your change is in the dispenser. Correct? Thank you."

  Note: The last two steps are the opposite of counting change without an automatic dispenser.

6. Information needed to complete a sales ticket or invoice

a. Who is purchasing item?

- Customer for work on own vehicle
  - Complete name of individual
  - Address
  - Phone number (include area code)
- Dealership or garage

b. How ticket is to be paid

- Cash
- Check
- Charge card
- Open charge account

  Note: For an open account charge, get the company name, address, account number, and other information as required by your employer so customer can be billed at the end of the month.
- Purchase order number

Note: Write down purchase order number if available.

c. Date of purchase

d. Quantity of items purchased

e. Part number(s)

f. Name of manufacturer and article

Information Sheet

g. List price

h. Net price (if appropriate)

i. Total price of all parts

j. Core charge or any other adjustments

k. Sales tax if applicable

l. Parts specialist's signature or initials

m. "Cash" or "Charge" stamped on invoice

n. Customer signature on invoice if it is a charge

7. **Procedure for accepting checks**

a. Notice the date on the check.

- Post-dated checks may not be cashed until that date arrives.
- Many businesses will not accept checks over thirty days old.

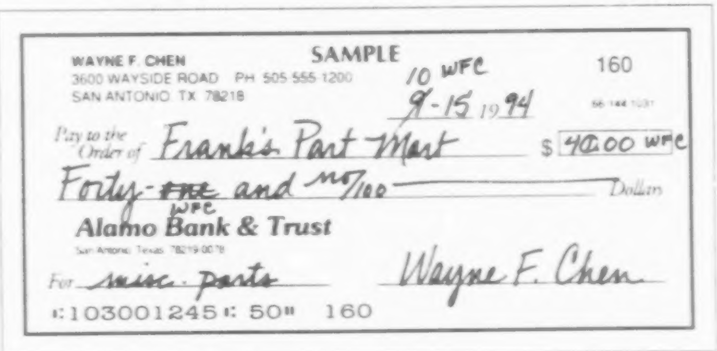
Note: When a check is in question for any reason, check with the manager.

b. Notice if the amount is clearly written in numbers and words—if the amounts are different, the bank will cash the amount written in words.

Note: Not being able to read a person's handwriting is a problem, but it is only an error if it appears to be done on purpose.

c. Have the customer initial any corrections on the date or amount.

Example:



WAYNE F. CHEN
3600 WAYSIDE ROAD PH 505 555 1200
SAN ANTONIO TX 78218

SAMPLE

160

10 WFC
9-15 1994

Pay to the Order of Frank's Part Mart $ 40.00 WFC

Forty-~~five~~ WFC and no/100 Dollars

Alamo Bank & Trust
San Antonio, Texas 78219-0078

For misc. parts

Wayne F. Chen

⑆103001245⑆ 50⑈ 160

Information Sheet

d. Write in customer's address if none is shown or if only a post office box number is printed on the check face.

e. Observe store rules for getting checks approved,limits on the amount of the check, and on accepting two-party, out-of-town, or company payroll checks.

f. Ask for proper identification courteously.

Note: Some businesses require more than one form of identification. Some stores subscribe to check approval services which have customer data on a computer network and are able to verify and approve checks electronically.

g. Examine signature on check.

- Make sure the signature is the same as the name printed on the check.
- Make sure the signature on the identification matches the signature on the check.

h. Do not accept checks written in pencil.

i. Do not accept checks marked "For deposit only." These checks may only be deposited in the bank.

j. Do not accept company checks with the company name typed on the face of the check rather than printed on the face of the check.

k. Do not accept checks without an account number or with altered account numbers.

8. Procedures for accepting credit cards

Note: Stores using computer terminals can authorize credit cards by just punching in the credit card number and amount or by running the card's magnetic strip through a card scanner.

a. Make sure the card is one your company accepts.

b. Notice the expiration date.

Note: Some cards print the date the card was issued instead of the expiration date; therefore it is important to know what period of time the cards are issued.

c. If the credit card number does not print clearly, write in the number on the credit card receipt.

d. Make sure the signature on the receipt matches the signature on the card.

Information Sheet

e. Check the credit card number with the warning list of bad, lost, or stolen cards.

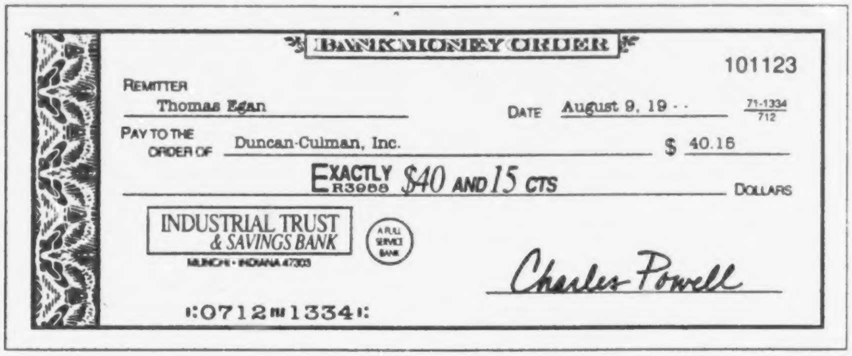
Note: This can be done easily by matching the last three numbers on the list and the card; the number on the list are in order.

f. Contact the credit company for authorization if the amount exceeds the company's set purchase limit.

g. Hold the card, stall the customer, and contact the manager if you discover a stolen credit card.

Note: If the customer leaves, remember to write down a good description.

9. Special precautions for handling money orders



BANK MONEY ORDER

101123

REMITTER Thomas Egan

DATE August 9, 19 - -

71-1334
712

PAY TO THE ORDER OF Duncan-Culman, Inc. $ 40.16

EXACTLY $40 AND 15 CTS DOLLARS
R3988

INDUSTRIAL TRUST
& SAVINGS BANK
MUNCIE • INDIANA 47303

A FULL SERVICE BANK

Charles Powell

⑆0712⑉1334⑆

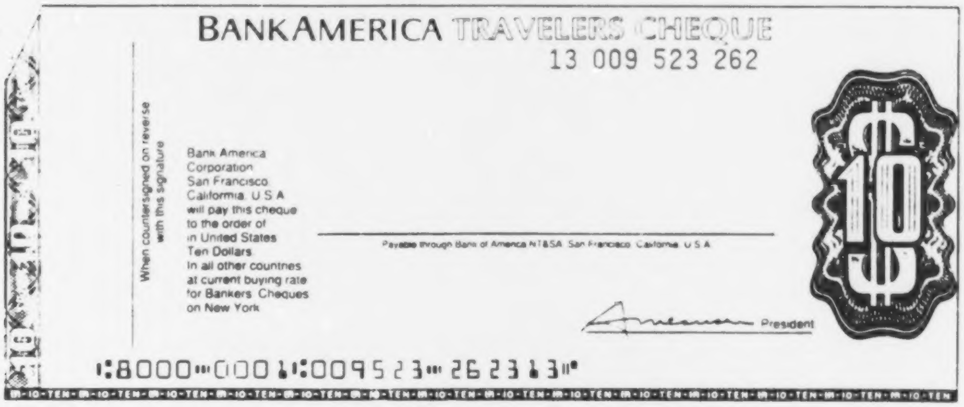
a. Do not cash if the amount has been altered, erased, or if the amount is in excess of the printed limit.

Note: Money orders are generally not written for over $100.

b. Notice the dates and signatures as carefully as if it were a regular check.

Information Sheet

10. Special precautions for handling travelers checks



BANKAMERICA TRAVELERS CHEQUE

13 009 523 262

When countersigned on reverse
with this signature

Bank America
Corporation
San Francisco
California U S A
will pay this cheque
to the order of
in United States
Ten Dollars
In all other countries
at current buying rate
for Bankers Cheques
on New York

Payable through Bank of America NT&SA San Francisco California U S A

President

⑆8000⑈0001⑆009523⑈262313⑈

10
10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN-10-TEN

a. Have customer sign check in your presence.

Note: Have the customer sign the check again if it has already been endorsed without your personal witness of the signature.

b. Compare the customer's signature with the signature on the front of the check made at the time the checks were purchased at the bank.

11. Handling exchange items and cores

a. Parts houses very often sell remanufactured (reman) or reconditioned parts that are less expensive than new parts.

Note: Alternators, starters, carburetors, fuel pumps, water pumps, brake shoes, and clutch discs are often available as reman units.

b. When a customer buys a reman unit, the core (old unit) is taken in by the parts person as a trade-in or allowance on the reman item.

c. Cores must be inspected for completeness, identification, and acceptable condition before credit is given to the customer.

Note: Price lists state allowances for the core or trade-in unit.

d. If the core is unacceptable because of damage or missing parts or unavailable, partial or no credit or discount is given.

Note: Tactfully explain to the customer why the core is unacceptable.

Information Sheet

e. When a core is taken in, be sure to tag it properly, credit it accurately, and check with the manager for the proper rack or core bin so it will be picked up as soon as possible.

12. Handling defective merchandise

a. A warranty is either given in writing or may just be implied.

b. Notice of the availability of written consumer warranty information should be posted within the customer's view.

- It is to state that the written warranty is at hand for the customer to read.
- If the product fails during this period, the manufacturer or supplier may replace, repair, or make an adjustment for the failure to the customer.

c. Get all the facts on a faulty part

- Find out what happened and which part failed.
- Find the original sale invoice; you will need the date and other identifying information.
- Learn what you can do to adjust the claim; if in doubt, check with the manager.
- Learn where the defective part must be sent next.

d. Paper work should be done as soon as possible.

- Prepare a "no charge" or partial charge ticket describing the reason for issuing a replacement part.
- Fill out a "merchandise return" form if needed to send to manufacturer, giving defect, date of purchase, your invoice number, and authority for return.
- Place warranty tag containing pertinent information such as the defect, identification, date sold, etc. on unit.
- File shipping documents if the manufacturer is not in the immediate area.
- Prepare a credit memo if the customer does not want a replacement part or if the part is not readily available.

  Note: Know the store's policy before giving any credit or refund for returned items.
- Fill out a "paid out" slip to put in the cash drawer if a cash refund is made.

Information Sheet

e. Other returns to manufacturers or suppliers

- Defective parts not in warranty may also be returned to manufacturer for repair.
- Explain to customer what wiii be done and what the cost of the repair will be.

13. Procedure for making a refund

Note: Refunds usually are made for returned merchandise, and sometimes for overcharges resulting from a mistake in billing of filling out a sales ticket or operating a cash register. Sometimes, merchandise is returned because it is damaged, and sometimes because the customer decides he or she does not need or want it, after all. Partial refunds also may be made to compensate a customer for keeping unsatisfactory merchandise.

a. Ask for original sales receipt to determine if the part or item was purchased at store and to determine the price paid for the item.

b. Inspect the returned item to make sure it is in the right box and no parts are missing or damaged.

Note: Returned merchandise must be in good condition so it can be sold again.

c. Complete a cash refund ticket or credit memo if parts are complete and in good condition.

d. Return amount of refund to customer if cash was paid.

e. Complete a "paid out" slip to show that a cash refund was made and place it in cash drawer.

f. Return item(s) to stock.

Note: Most stores will not allow customers to return electrical items such as voltage regulators, switches, or relays once they have been installed unless they are defective.

Sales Policies and Procedures
Unit 13

Student Supplement 1—Guidelines for Completing Credit-Card Sales Transactions

When businesses accept credit cards in payment for goods or services, they do so as if the credit cards were the same as money. Consequently, the documents involved in a credit-card sale must be treated as cash. But just as a cashier should make sure that money given in payment is acceptable currency, the right amount, and not counterfeit, he or she should also take some steps to ensure that the credit-card transaction will result in the company's receiving payment for the goods or services.

A cashier has three sources of information when making a credit-card sale: the card, the person presenting it, and the credit agency. A valid transaction requires checking all three sources.

Check to see that the **credit card**

- Is a card your business accepts.
- Has been signed.
- Has not been altered.
- Has not expired.

Check to see that the **customer**

- Is the person named on the card, or an authorized purchaser.
- Signs the sales slip with a signature that matches that on the card.
- Does not seem exceptionally nervous about the purchase.

Check the **credit agency's** information by

- Verifying that the card number is not listed on the agency's warning bulletin.
- Calling the credit agency if the purchase exceeds the agency's or your company's automatic charge limit (floor limit).
- Calling the credit agency if the card is not presented, as with a telephone or mail order.
- Calling the credit agency if anyone other than the person named on the card presents it.
- Calling the credit agency if there is any doubt about the validity of the card.

Check the **transaction form** to see that

- The correct form has been used.
- The form is filled out completely and accurately, including the date, description of goods or services, prices and amounts, and taxes and totals.
- The signature on the form is the same as that on the card.
- The imprinter information shows clearly.
- The purchase amount is less than the amount requiring additional approval.
- The card's expiration date has been checked.

Student Supplement 1

Every person in the establishment who deals with the transaction should check these items. Normally, the cashier will check the card and form. If additional approval by a manager or supervisor is required, that person should also complete each check. This procedure is important because if incomplete, inaccurate, or inadequately authorized transaction forms are submitted to the credit agency, the establishment is still financially liable. The credit agency need not honor such transactions.

Sales Policies and Procedures
Unit 13

Assignment Sheet 1—Count Change

Name ______________________________ Overall Rating ______________

Evaluation criteria	**Rating**
Directions have been followed	______
Counts are correct	______

Introduction: As a parts specialist, whether retail or wholesale, you will be handling money, and that inevitably means making change. Although most cash registers are equipped to do the math for you, learning how to make change directly from the change drawer will prevent embarrassing moments when a relatively simple task seems nearly impossible when faced with a waiting customer.

Directions:

1. Leave the bill on the register while counting change.

2. When making change, give the customer the least number of coins and bills possible.

   Example: Instead of two dimes and a nickel, give them a quarter, instead of six $1 bills, give them a $5 bill and one $1. If you are out of larger denominations, however, you will have to use whatever you can.

3. Repeat the amount of the sale and the amount of money received by the customer.

4. Count the money to yourself as it is taken from the cash drawer and then again back to the customer.

5. Begin with the smallest amount, and count back to the amount given by the customer.

   Example: For a $2.87 sale from a ten dollar bill, say, "That will be two eighty-seven out of ten"; then count out three pennies as "two eighty-eight, two eighty-nine, two ninety," then one dime, "three dollars," then two one dollar bills, "four dollars, five dollars," and a five dollar bill, "and five makes ten. Thank you."

Assignment Sheet 1

6. Use the fewest number of coins and bills and record the correct amount of change for each sale listed.

Sales No.	Amount of sale	Amount Rec'd	Coins					Bills			
			1¢	5¢	10¢	25¢	50¢	$1	$5	$10	$20
Example	$6.73	$10.00	2			1		3			
1	$12.33	$20.00									
2	$7.88	$20.00									
3	$23.07	$40.00									
4	$ 3.00	$50.00									
5	$ 7.14	$20.00									
6	$8.12	$10.00									
7	$ .78	$10.00									

Sales Policies and Procedures
Unit 13

Assignment Sheet 2—Complete a Sales Ticket

Name ______________________ Overall Rating ____________

Evaluation criteria	Rating
Sales information correctly entered on form	______
Entries are legible	______

Introduction: Whether your employer uses computers or handwritten sales tickets, as a parts specialist you will need to know what information is needed to successfully complete a sales ticket. In Objective 5 you studied sales tickets. This exercise will help you apply your knowledge.

Directions: Use the following information to fill in as much of the sales ticket as you can.

Customer name: Danita Hill, and it is a cash ticket
Date: October 4, 1994
Your name is John.
Parts bought:
    Two headlights (part #6401) price $9.00 each
    One alternator belt (part #35508) price $12.95
    Three cans of DOT 3 Brake Fluid (part #65-1) price $3.98
    Headlights are stocked in bin A-31
    Belt is in bin B-12
    Brake Fluid is in bin C-9

Customer is not entitled to any discounts and pays 5% sales tax.

Assignment Sheet 2

INVOICE NO. 63689

Sold To ______________________________

____

____

Phone: ______________________________

PURCHASE ORDER NUMBER	
CASH	CHARGE
CHECK	ACCOUNT NO.
DATE	

STOCK	QTY	NUMBER	DESCRIPTION	MFR	PRICE	NET	TOTAL	

Electrical Items or Parts Not Returnable **** Invoice Must Accompany Returned Goods

[illegible] Handling Fee After [illegible] Days **** [illegible] Interest Per Month On Past Due Accounts

SALESPERSON	LABOR	TRANS	TELE	TAX

TAX & ETC.	
TOTAL $	

RECEIVED BY	CUSTOMER SIGNATURE

Sales Policies and Procedures
Unit 13

Assignment Sheet 3—Accept Checks

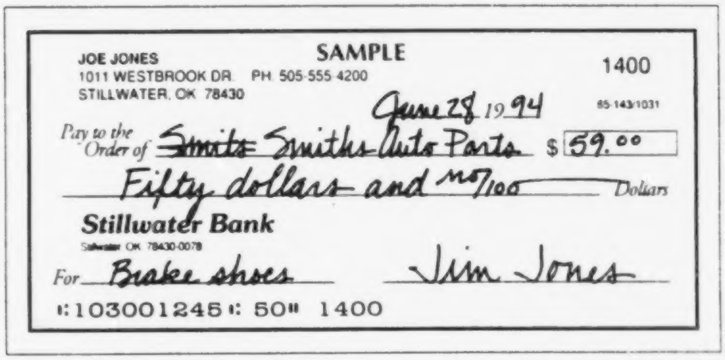
Name ______________________________ Overall Rating ______________

Evaluation criteria	Rating
Directions have been followed	_____
Errors listed	_____

Introduction: As a parts specialist, whether retail or wholesale, you will be required to deal with customer checks. A number of fraud and error problems can arise with checks. This exercise will strengthen your skills at spotting problem areas with a pair of sample checks.

Directions: Under both of the following checks, list all the errors you can find. The checks were received on July 30, 1994.

1.



JOE JONES
1011 WESTBROOK DR. PH 505-555-4200
STILLWATER, OK 78430

SAMPLE

1400

June 28 1994

85-143/1031

Pay to the Order of ~~Smits~~ Smiths Auto Parts $ 59.00

Fifty dollars and no/100 Dollars

Stillwater Bank
Stillwater OK 78430-0078

For Brake shoes

Jim Jones

⑆103001245⑆ 50⑈ 1400

____

____

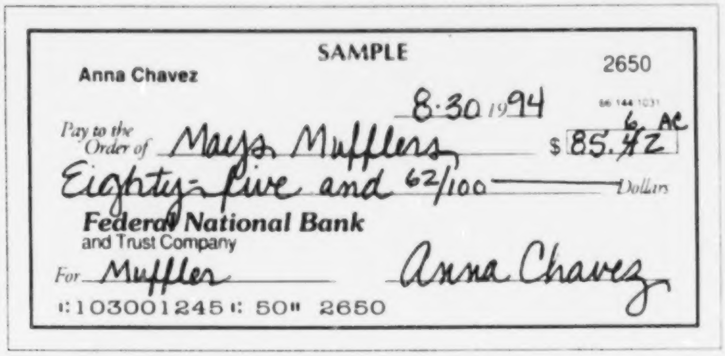
____

____

____

Assignment Sheet 3

2.



SAMPLE

Anna Chavez

2650

8·30 1994

86 144 1031

Pay to the Order of Mays Mufflers

6 AC

$ 85.~~4~~2

Eighty-five and 62/100 Dollars

Federal National Bank
and Trust Company

For Muffler

Anna Chavez

⑆103001245⑆ 50⑈ 2650

Sales Policies and Procedures
Unit 13

Assignment Sheet 4—Complete a Credit Memo

Name ______________________ Overall Rating ____________

Evaluation criteria	**Rating**
Information correctly entered on form	______
Entries are legible	______

Introduction: As a parts specialist, from time to time, you will be faced with issuing credit memos for a variety of reasons. In Objective 13 you were introduced to credit memos. This exercise will help you apply your knowledge.

Directions: Use the following information to fill in as much of the credit memo as you can.

Note: It is the same as filling out a sales ticket, but it is done on a different form.

Date: September 1, 1994
The parts specialist who made the sale was George Wagner.
Jones Chevrolet has an open account and has charged the sale.
Customer Account No.: 00571
They also have a valid tax number so no tax was charged.
They want to return a defective carburetor, part #2261.
List price was $125.00, their jobber price was $90.00 (as noted on the original sales slip.)
Jones Chevrolet's address is 100 Main Street, Dallas, Texas, 76200.
Phone number is (512) 555-1672
The customer returning the part is Cybil Jones.
Your name is Ramona Juarez.

Question: Would you give this customer back $90 cash?

Assignment Sheet 4

ORIGINAL

AUTOMOTIVE SUPPLY INC.

INVOICE NO.

Sold To: ____________________

____

____

Phone: ____________________

Reason for Return: ____________________

PURCHASE ORDER NUMBER	
CASH	CHARGE
CHECK	ACCOUNT NO.
DATE	

STOCK	QTY	NUMBER	DESCRIPTION	PRICE	NET	TOTAL	

CREDIT MEMO

Electrical Items or Parts Not Returnable **** Invoice Must Accompany Returned Goods

% Handling Fee After 5 Days **** [illegible] Interest Per Month On Past Due Accounts

SALESPERSON	LABOR	TRANS	TELE	TAX

TAX & ETC.

TOTAL $

ISSUED BY	CUSTOMER SIGNATURE

Sales Policies and Procedures
Unit 13

Job Sheet 1—Process a Credit-Card Sale

Name ______________________ Attempt Number ________

Date ______________________ Overall Rating ________

Evaluation criteria	**Rating**
Completeness	______
Accuracy	______
Speed	______
Neatness	______
Smoothness of procedure (performed from memory)	______

A. Introduction: Credit-card sales transactions are just as valuable to the establishment as are the transactions involving the exchange of currency—and the accurateness you demonstrate in completing this transaction is just as important also. In this job sheet, you will practice using the materials and equipment used in completing this important transaction.

B. Equipment and Materials

- Credit cards
- Imprinter
- Sales drafts
- Pen
- Warning bulletin
- Bank authorization machine
- Cash register

C. Procedure

Note: Assume that your establishment accepts Master Card, Visa, American Express, and Diner's Club credit cards.

1. Check the card.

☐ a. Check to see that it is a card your establishment accepts.

☐ b. Check to see that the card has not expired.

Job Sheet 1

- ☐ c. Check to see that the card has been signed.
- ☐ d. Check for signs of mutilation or alteration.

☐ 2. *If* the card is acceptable, continue with the procedures; *if* the card is *not* acceptable, politely inform the customer and follow your establishment's policies for handling the situation.

☐ 3. *If* your establishment has a bank authorization machine, slide the card—signature facing you—through it, reading the digital window for instructions and entering the amount of sale from the customer check.

OR

If your establishment does not have a bank authorization machine, check the warning bulletins to see that the card is not listed.

Note: If the bank authorization machine reads "Not authorized" or the card is listed on the warning bulletin, follow your establishment's policies for this situation.

4. Imprint the card onto a sales draft.

- ☐ a. Prepare the imprinter for the transaction.

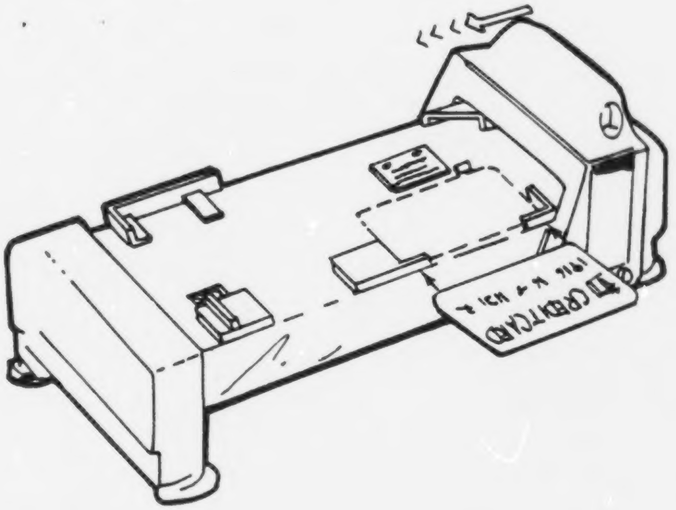
  Note: Some credit-card imprinters, imprint the total amount of the transaction. The cashier must dial the amounts before imprinting the card. Other imprinters mark the date. Be sure that the date is correct before using the imprinter.

- ☐ b. Place the credit card in the imprinter face up.
- ☐ c. Place the sales draft, face up, on top of the card.
- ☐ d. Push the imprinter handle all the way across the sales draft and slide it back again.

  Note: As the bar presses down on the sales draft and the card, the raised letters on the card are transferred onto the draft through two layers of carbon paper. The imprinter may look similar to the one shown in Figure 1 or it may be an electronic imprinter that works in a similar manner.

Job Sheet 1

Figure 1



5. Remove the sales draft and check the imprint.

☐ a. Compare the sales draft to the credit card to be sure that the customer's name, account number, and expiration date show legibly and completely.

☐ b. Check to see that other imprinter information shows.

6. Fill in the sales draft.

☐ a. Place an "X" on the type of credit card if appropriate.

☐ b. Place an "X" on the box by "Expiration Date Checked."

☐ c. Write in the bank authorization number in the "Authorization" block just as it appears on the digital window of the bank authorization machine, if used; *if* not used, call the credit-card company, get an authorization number, and initial the authorization block.

☐ d. Write in the date, unless it was imprinted by the imprinter.

☐ e. Describe the merchandise or service rendered on the lines provided.

Job Sheet 1

- ☐ f. Write in the price of each item.
- ☐ g. Calculate and write in the sales tax (from tax chart or cash register if computed by register).
- ☐ h. Total the amounts.

☐ 7. Obtain card holder's signature on sales draft.

☐ 8. Compare the signature on the credit card with that on the sales draft.

Note: If the signature or names do not match, follow your establishment's policies for this situation.

☐ 9. Initial the block labeled "Clerk."

☐ 10. Seek further authorization as required by establishment's policy.

☐ 11. Tear off the customer's copy and return it to the customer, along with the credit card.

☐ 12. Ask the customer whether he or she wants the carbons or whether you should destroy them.

Note: The carbons contain all the information on the credit card and should be handled carefully because of the confidential information they contain. Give them to the customer or tear them in two and place them in a trash receptacle.

☐ 13. Place your copy of the sales draft in the appropriate place in the cash register.

Caution: To the business, the credit-card sales draft is just as valuable as money. It must be returned to the credit-card agency for money.

Evaluator's comments: ______________________________

____

____

Sales Policies and Procedures
Unit 13

Job Sheet 2—Make a Refund

Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Politeness	______
Made accurate change	______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and Materials

- Play or real money
- Cash drawer
- Merchandise
- Sales ticket

B. Procedure

Note: Assume store policy is for you, the employee, to make refunds from the cash register.

☐ 1. Ask customer if he or she would like to exchange for other merchandise. (He or she will ask for cash refund.)

☐ 2. When customer asks for cash refund, take merchandise, set it aside.

☐ 3. Use tax table to figure sales tax on individual item to be returned.

☐ 4. Add tax to price of item on sales ticket to get total.

☐ 5. Count money back to customer, preferably into customer's hand.

☐ 6. Be polite.

Example: "I'm sorry there was a problem," if there was one, or "Come again, soon," for simple exchanges where customer just changed his or her mind.

Job Sheet 2

☐ 7. Deal with returned merchandise according to store policy.

Evaluator's comments: ____

____

____

Sales Policies and Procedures
Unit 13

Job Sheet 3—Send and Verify Receipt of a FAX Message

Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Message properly sent	______
Receipt of message verified	______

Instructions: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

A. Equipment and Materials

- FAX document prepared in Assignment Sheet 6
- FAX machine
- Receiving FAX at a selected location

B. Procedure

☐ 1. Place the FAX document in the sending/receiving unit.

☐ 2. Dial the telephone number at the FAX receiving unit.

☐ 3. Alert the person at the receiving number that you are going to send a FAX.

☐ 4. Place your telephone in the coupler.

☐ 5. Press the SEND button.

☐ 6. Wait until transmission is complete.

☐ 7. Take the phone from the coupler and verify with the receiving party that the FAX was received.

Job Sheet 3

☐ 8. Remove the FAX document and turn off or secure FAX machine.

Evaluator's comments: ____________________

Sales Promotion
Unit 14

Objective Sheet

Unit Objective

After completing this unit, the student should be able to solve problems concerning sales promotion and plan and construct an effective display. The student should demonstrate these competencies by completing the assignment sheets and job sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to sales promotion with their correct definitions.
2. Match traits of a successful salesperson with their descriptions.
3. Match basic steps in selling with their characteristics.
4. Arrange in order the procedure for waiting on customers.
5. List important sales promotion tools.
6. List three types of displays.
7. List four purposes of displays.
8. Select advantages of displays.
9. Identify basic display arrangements.
10. Match elements of good display design with their characteristics.
11. Select common display materials.
12. Select true statements concerning uses of colors in displays.
13. Select true statements concerning the placement of interior displays.
14. Explain the procedure for planning and creating a display.
15. Select true statements concerning guidelines for setting up interior displays.
16. Match major advertising media with their advantages/disadvantages.

Objective Sheet

17. Select factors to consider in selecting advertising media.

18. Plan a display. (Assignment Sheet 1)

19. Solve problems concerning sales promotion. (Assignment Sheet 2)

20. Construct a display. (Job Sheet 1)

Sales Promotion
Unit 14

Suggested Activities

Instructional Plan

Preparation

- Review unit and plan presentation. Study the specific objectives to determine the order in which you will present the objectives.

  Review unit introduction and teaching suggestions included in the delivery and application section below and plan classroom activities. Also note suggested resources.

  Plan presentation to take advantage of student learning styles and to accommodate special-needs students.
- Obtain films, videotapes, and other media to supplement instruction of this unit.
- Make transparencies from the transparency masters included in this unit.
- Arrange for a local parts dealer to visit the class to discuss this unit and its application to the work of a parts specialist.
- Prepare classroom. Put up posters and charts and display articles and other references related to the objectives of this unit.

Delivery and Application

Unit Introduction

- Provide students with objective sheet and information sheet. Discuss unit and specific objectives.

The skill areas appearing in bold-face type in the teaching suggestions refer to the academic and workplace skills identified by the American Society of Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

Suggested Activities

Teaching Suggestions

Objective 1 Match terms related to sales promotion with their correct definitions.

- Read and discuss terms and definitions, giving the class examples of each, and encouraging class members to discuss the terms in light of their own experiences. **(Listening for content; orally expressing a thought)**

Objective 2 Match traits of a successful salesperson with their descriptions.

- Read and discuss traits with students. Emphasize the importance of developing these traits to be successful as a parts specialist. **(Listening for content; orally expressing a thought)**
- Ask students to relate instances when they have observed a salesperson who demonstrates many of these traits. **(Critical thinking; orally expressing a thought or idea; listening for content)**

Objective 3 Match basic steps in selling with their characteristics.

- Demonstrate basic steps in selling. Then, discuss each step with students. **(Listening for content)**

Objective 4 Arrange in order the procedure for waiting on customers.

- Discuss and demonstrate procedure for class. Answer any questions they have concerning the procedure. **(Listening for content)**
- Using the skills learned in Objectives 2 through 4, have students role play to demonstrate the proper sales steps and procedure for waiting on customers. **(Critical thinking; adapting to an organization's goals and values)**

Objective 5 List important sales promotion tools.

- Discuss with students how each of these tools might be used to effectively promote a product or products. Point out which ones are most commonly used in the parts supply business. **(Listening for content; orally expressing a thought or idea)**

Suggested Activities

- Have students find examples of sales promotion tools used in the parts supply business.

  This can be done as a team activity with each team reporting to class what items they found and if they thought the sales promotion tools were successful. **(Problem solving; teamwork; orally communicating a thought or idea; listening for content)**

Objective 6 List three types of displays. **Objective 7** List four purposes of displays. **Objective 8** Select advantages of displays.

- Explain how displays support the whole promotional effort and how good displays help customers make buying decisions. **(Listening for content)**

Objective 9 Identify basic display arrangements.

- Using Transparency 1, "Basic Display Arrangements," discuss with the class various display arrangements. **(Listening for content)**

Objective 10 Match elements of good display design with their characteristics.

- Use Teacher Supplement 1, "Elements of Display Design," to provide some additional design tips to students. **(Listening for content)**

Objective 11 Select common display materials.

- Discuss common display materials with class. Point out the cost of using the various materials and how less expensive materials such as poster board and felt-tip pens can be used effectively in a display. **(Listening for content; adapting to the organization's goals and traditional modes of operation)**

Objective 12 Select true statements concerning uses of colors in displays.

- Use Transparency 2, "Color Wheel" and Teacher Supplement 2, "How to Sell With Colors" to explain how color can draw the customer's attention to a display and how color can help sell a product. **(Listening for content)**

Suggested Activities

- Have class discuss how colors affect their mood, and ask students to give examples of color combinations that they like best. **(Communicating a thought or idea; listening for content)**

Objective 13 Select true statements concerning the placement of interior displays.

- Reinforce the importance of placing a display where it will get the best results.
- Arrange for class to visit a number of stores to observe and evaluate the effectiveness of the displays found there. Then, have the class discuss what they observed. Ask them to use the information they learned in Objectives 6 through 13 as part of their evaluation. **(Critical thinking; listening for content; orally expressing a thought or idea)**

Objective 14 Explain the procedure for planning and creating a display.

- Discuss each step in the procedure emphasizing the importance of good planning and preparation. **(Listening for content)**
- Make arrangements with a local parts store or dealership for students to make displays for the businesses.
- Assign students to teams of four before having them begin Assignment Sheet 1. Use same teams to complete Job Sheet 1.
- Review evaluation criteria and directions, then, have students complete Assignment Sheet 1, "Plan a Display." **(Listening for content; creative thinking; teamwork)**

Objective 15 Select true statements concerning guidelines for setting up interior displays.

- Discuss guidelines, with students. Answer any questions students have concerning setting up interior displays. **(Listening for content; orally communicating a thought)**

Suggested Activities

- Discuss evaluation criteria and procedure for constructing a display, then, using display plan created in Assignment Sheet 1, have students complete Job Sheet 1, "Construct a Display." **(Listening for content; orally communicating a thought or idea; teamwork)**

Objective 16 Match major advertising media with their advantages/disadvantages. **Objective 17** Select factors to consider in selecting advertising media.

- Have a class discussion and ask students to give their opinions about various advertisements or commercials they see or hear. **(Critical thinking; orally expressing a thought or idea; listening for content)**
- Invite members of various advertising media to class to discuss their medium's ability to reach an audience. Give students an opportunity to ask questions. **(Listening for content; orally expressing a thought or idea)**
- Hand out Assignment Sheet 2, "Solve Problems Concerning Sales Promotion." Review what you have discussed in class and answer any questions concerning sales promotion. Read the evaluation criteria and the directions, then have students complete the assignment. **(Problem solving; communicating a thought or idea in written form in a clear, concise manner)**

Evaluation

- Evaluate assignment sheets. See the evaluation criteria listed at the top of each assignment sheet.
- Evaluate job sheet. See the evaluation criteria listed at the top of each job sheet.
- Give and evaluate the written test. See the component "Answers to Written Test."
- Compile written-test, assignment-sheet, and job-sheet scores on the "Unit Evaluation Form."
- Reteach and retest as required.

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Suggested Activities

Suggested Resources

Resources Used in Developing This Unit

- *AWAE Counterman's Guide*. Springfield, IL: Automotive Wholesalers of Illinois.
- Molinaro, Gary A. *Counterman's Guide to Parts and Service Management*. Albany, NY: Delmar Publishers, Inc., 1989.
- Nelson, Frank W. *Distributive Education II*. Stillwater, OK: Curriculum and Instructional Materials Center, Oklahoma State Department of Vocational and Technical Education.
- Sumpter, Tom. *Basic Auto Parts Training*. Fairview, OR.

Supplemental Resources

- For instructors with access to a NAPA auto parts dealer, NAPA provides its dealers with a comprehensive training program which includes a number of audio-visual presentations on a variety of subjects. *Retail Marketing for Store Employees*, a 40-minute video and two workbooks comprises a six-hour program of instruction on serving the retail customer, presenting merchandise, signage and in-line displays, and store maintenance. See your NAPA dealer for possible access.

Instructions for Evaluating Student Performance

- When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.
- Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.
- Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Suggested Activities

- Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

No—Is unable to perform job satisfactorily.

Sales Promotion
Unit 14

Answers to Assignment Sheets

Assignment Sheet 1 — Student performance should be evaluated according to the criteria listed on the assignment sheet.

Assignment Sheet 2 — Student performance should be evaluated according to the criteria listed on the assignment sheet. Content of written answers should be based on classroom discussions and visits with media representatives.

Sales Promotion
Unit 14

Answers to Written Test

1.	a.	2	d.	5	g.	4
	b.	7	e.	3	h.	8
	c.	1	f.	6		

2.	a.	4	e.	6	h.	9	k.	8
	b.	7	f.	12	i.	1	l.	5
	c.	10	g.	3	j.	13	m.	11
	d.	2						

3.	a.	5
	b.	1
	c.	3
	d.	2
	e.	4

4.	a.	7	d.	1	g.	8
	b.	4	e.	3	h.	9
	c.	2	f.	5	i.	6

5. Any four of the following:

   a. Displays
   b. Catalogs
   c. Contests
   d. Coupons
   e. Giveaways
   f. Sampling
   g. Banners and signs

6. a. Window
   b. Interior
   c. Outside

7. a. To attract customers' attention so that they will consider the purchase of a product
   b. To educate customers about products and services
   c. To establish and maintain a positive business image
   d. To introduce new or seasonal items

8. b, c, e

Answers to Written Test

9. a. Dump
   b. Pyramid
   c. Zigzag
   d. Stair step
   e. Radiating
   f. Repetition

10. a. 5   d. 3
    b. 4   e. 6
    c. 1   f. 2

11. b, c, d, f, g, h, i, j

12. b, e, f

13. a, c, d, e

14. Answer may be in student's own words, but should include the following:

    a. Set a budget for displays and know the specific cost of each planned display.
    b. Select a product or products.
    c. Develop an idea or theme.
    d. Sketch the display design.
    e. Select props.
    f. Collect display materials needed in construction.
    g. Construct the display.
    h. Make necessary adjustments.
    i. Maintain the display.

15. a, c, d, f

16. a. 2
    b. 3
    c. 6
    d. 1
    e. 5

17. a, b, c, e, f

Sales Promotion
Unit 14

Written Test

Name ______________________________ Score ______________

1. Match the terms related to sales promotion with their correct definitions. Write the numbers on the blanks provided below.

______a. Asking the customer for the order

______b. Fixture used to build a display

______c. A means of informing potential customers so that they may choose more wisely from a variety of businesses, goods, and services available in their market area

______d. The ways to reach people through advertising

______e. The art of communicating with people visually in order to get their attention so that they will consider the purchase of a product

______f. Coordination of efforts to establish communication with potential customers

______g. The blueprint which shows what the display will look like and what is needed for assembly

______h. The process of determining the needs and wants of a customer and presenting a product, service, or idea in such a way that a customer is motivated to make a favorable buying decision

1. Advertising
2. "Closing a sale"
3. Display
4. Display sketch
5. Media
6. Promotion
7. Prop
8. Selling

Written Test

2. Match traits of a successful salesperson with their descriptions. Write the numbers on the blanks provided below.

______ a. Faith or trust in one's actions and abilities

______ b. To continue in a job or action despite opposition or discouragement

______ c. The ability to carry out duties or obligations consistently

______ d. The ability to say and do the right thing to maintain a good relationship with the customer

______ e. The ability to control ones' emotions or actions in a given situation

______ f. Excitement in performing an activity

______ g. Fairness of conduct

______ h. Ability to take action quickly in a new situation or unexpected difficulty

______ i. The ability to positively influence another person to meet a common goal

______ j. Having facts about a product which can be translated into specific benefits that fulfill the customer's needs or wants

______ k. The ability to communicate one's thoughts and ideas to another individual in a manner which can be easily understood

______ l. Handling oneself in a self-assured, easy going manner

______ m. Having a clean and neat appearance and wearing clothes that are suitable to the business

1. Leadership
2. Tact
3. Honesty
4. Confidence
5. Poise
6. Self-control
7. Perseverance
8. Conversational ability
9. Resourcefulness
10. Reliability
11. Good grooming
12. Enthusiasm
13. Product knowledge

Written Test

3. Match basic steps in selling with their characteristics. Write the numbers on the blanks provided below.

______a. Watch for buying signals; make a trial close; promote related items; handle sales transaction.

______b. Have product knowledge; know competitor's line.

______c. Personalize the product to fit customer's needs; involve the customer in demonstration; know the merchandise.

______d. Dress to fit the role of a successful salesperson; be prompt, courteous, and provide a friendly atmosphere for the customer; ask questions to determine customer needs and listen.

______e. Anticipate objections and prepare answers to them in advance; know when to back off.

1. Preparation
2. Approach
3. Demonstration
4. Overcoming customer objections
5. Closing the sale

4. Arrange in order the procedure for waiting on customers by placing the correct sequence number in the appropriate blank.

______a. Offer to pick up or order any parts that you do not have in stock.

______b. Take scratch pad containing customer's entire order and look up all part numbers and prices before going to shelf.

______c. Write *entire* customer order on scratch pad.

______d. Recognize the customer.

______e. Suggest related items, if appropriate.

______f. Go to bins and fill the order.

______g. If part boxes are dirty, dust them off and place customers order in a sack or box.

______h. Thank customer and let him/her know you appreciate the business.

______i. Invoice the sale.

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Written Test

5. List four important sales promotion tools.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

6. List three types of displays.

a. ______________________________

b. ______________________________

c. ______________________________

7. List four purposes of displays.

a. ______________________________

b. ______________________________

c. ______________________________

d. ______________________________

8. Select advantages of displays. Place an "X" beside each item that applies.

______a. Can help fill unused space in store

______b. Can be a relatively inexpensive means of promoting a product

______c. Can be changed easily to reflect trends

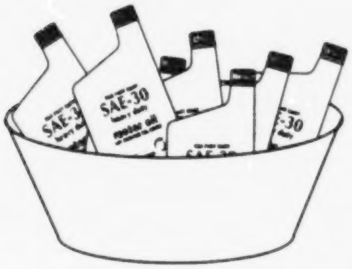
______d. Can help sell products that have no buying appeal

______e. Can support advertising as part of a total promotional effort

______f. Can make small amounts of sale merchandise readily seen by customers

Written Test

9. Identify basic display arrangements.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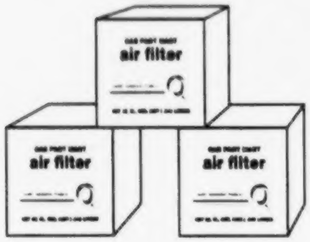
SAE-30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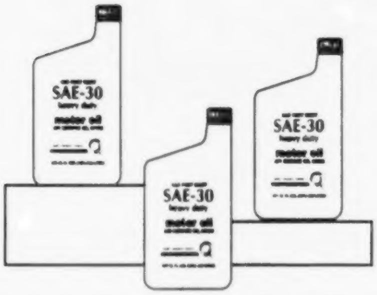
a. ______________________ b. ______________________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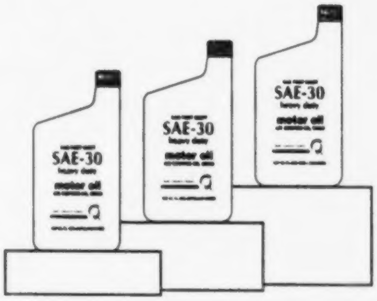
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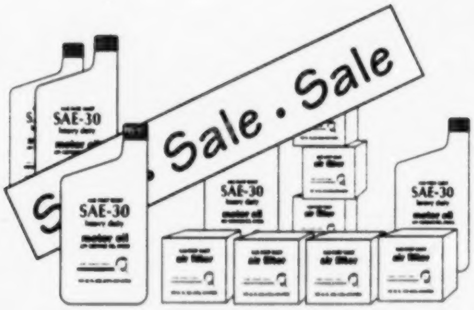
c. ______________________ d. ______________________


Sale . Sale . Sale
SAE-30
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motor oil
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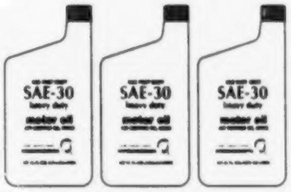
SAE-30
air filter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motor oil
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motor oil
SAE-30
motor oil

e. ______________________ f. ______________________

Written Test

10. Match elements of good display design with their characteristics. Write the numbers on the blanks provided below.

_____a. The impression of weight created by the appearance of the display, affected by line, shape, size, color, and texture

_____b. Can create special effects through contrast by using different sized items

_____c. Physical appearance of items in a display; a variety of shapes are used in the backgrounds and arrangements for props, and as containers

_____d. Calls attention to parts of the display to create harmony; directs eye through display

_____e. The look or feel of the surface of an item; can be real or imagined

_____f. Affects customer's buying mood; attracts customers to display

1. Shape
2. Color
3. Line
4. Size
5. Weight
6. Texture

11. Select common display materials. Place an "X" beside each item that applies.

_____a. Brick

_____b. Lumber

_____c. Lights

_____d. Fabric

_____e. Glass

_____f. Signs

_____g. Paper

_____h. Paint/felt-tip pens

_____i. Props

_____j. Velcro strips

Written Test

12. Select true statements concerning uses of colors in displays by placing an "X" in the appropriate blanks.

_____a. Color attracts attention to a display, and blues, greens, and yellows are the best attention getters.

_____b. Colors are generally classified as warm or cool and can be used to make a display snappy or subdued.

_____c. Colors next to each other on a color wheel are said to be warm and colors opposite each other on a color wheel are said to be cool; both warm and cool work well in displays, especially seasonal displays.

_____d. Mix many colors in a display to attract a viewers' eye, but always avoid putting colors that clash too close together.

_____e. Both black and gray are good background colors or can be used as arrows, dots, or squares to focus attention on specific items in a display.

_____f. Color displays do not demand expensive paints or equipment; good displays can be made from inexpensive poster board and felt-tip pens.

13. Select true statements concerning placement of interior displays by placing an "X" in the appropriate blanks.

_____a. Just inside front door

_____b. Middle of aisles

_____c. In areas where items normally are sold

_____d. Opposite service counters

_____e. Checkout counters

Written Test

14. Explain the procedure for planning and creating a display.

15. Select true statements concerning guidelines for setting up interior displays by placing an "X" in the appropriate blanks.

______a. Design displays to show the products to their best advantage.

______b. Use soft lighting or contrasts in display elements such as color, shape, and size.

______c. Make sure display areas allow enough aisle space for customers to move freely about the store.

______d. Place displays perpendicular to the main traffic aisle rather than parallel so customers can stop and examine products without blocking traffic.

______e. Use space at the back of the store for products which demand special promotional effort.

______f. Use large bold figures on show cards when price is important or a point needs to be emphasized.

Written Test

16. Match major advertising media with their advantages/disadvantages. Write the numbers on the blanks provided below.

______a. Advantages — It adds prestige to a product or business; can get effective use of color; has a long reading life; may reach a select audience.

Disadvantages — It is relatively expensive; may waste circulation unless business's trading area is quite large; is not easy to change on short notice.

______b. Advantages — It has direct and personal appeal to one carefully selected group; is relatively inexpensive if special postal rates can be obtained.

Disadvantages — It requires that the mailing list be constantly revised; may be ignored by some people as "junk" mail.

______c. Advantages — It has a large diversified audience; is good for national advertising; is easy to demonstrate a product.

Disadvantage — It is expensive.

______d. Advantages — It is widely read; is relatively inexpensive; can be changed quickly.

Disadvantage — It has a short reading life.

______e. Advantages — It is suited for products of general demand because of large diversified audience; can be changed easily; can be repeated frequently; is relatively inexpensive.

Disadvantages — It may waste coverage on many people who are not potential customers; is not suited for products that must be seen to develop customer interest.

1. Newspaper
2. Magazine
3. Direct mail
4. Yellow pages
5. Radio
6. Television

Written Test

17. Select factors to consider in selecting advertising media. Place an "X" beside each item that applies.

_______a. How many potential customers will be reached and what is the cost per prospect?

_______b. Does the media fit store's image?

_______c. Can selling message be repeated?

_______d. Will media reach more than desired market area?

_______e. Is media flexible for copy changes?

_______f. Can store afford to advertise in selected media?

***Permission to duplicate this test is granted.**

Sales Promotion
Unit 14

Unit Evaluation Form

Student Name ______________________________ Unit Rating __________

Assignment Sheet 1—Plan a Display Rating _____

Comments: ____

____

Assignment Sheet 2—Solve Problems Concerning Sales Promotion Rating _____

Comments: ____

____

Job Sheet 1—Construct a Display Rating _____

Comments: ____

____

Written-Test Scores

Pretest _____ Posttest _____ Other _____

Other ____

____

Teacher Signature ______________________________ Date __________

Student Signature ______________________________ Date __________

***Permission to duplicate this form is granted.**

Sales Promotion
Unit 14

Teacher Supplement 1—Elements of Display Design

Much of the research and writing about display building revolves around fashion merchandising, or the merchandising of department store wares. However, there is no reason not to apply these principles to parts sales. Some of the profitable chain stores do exactly that.

Most of all, teach your students this point: The measure of a good display is, "Does it sell merchandise?"

Following are some additional tips you can teach students about elements of good display design to reinforce Objective 10.

Balance — The display designer can choose formal or informal balance, the same choice as can the designer of an advertisement. With either choice, the designer draws an imaginary line down the center of the display. Formal balance is symmetrical or evenly distributed. Every object on the left side must be matched by an object on the right side. When informal balance is used, the items on each side do not repeat each other. However, the shapes and spaces on each side are roughly equal.

Proportion — Proportion can be explained as a proper relationship between objects and spaces, and also as a proper relationship between objects. Items can purposely be made out of proportion to the rest of a display for impact. An example might be a large, gloved fist above a glove display.

Contrast — Contrast is the use of objects than seem different. It attracts customers' attention. It can be contrast in size, color, or the mix of unrelated merchandise. Contrast should not be used too frequently in a store. It is a tool of surprise.

Rhythm — A good display composition should have rhythm, which should lead the customer's eyes from the dominant object or objects down to the arrangement of accessories or alternate parts of the display. The flow may be created with the shape or line in which objects are arranged. It may be created with the sweep of a mannequin's arm. The customer's eyes will naturally go in a circular route if the objects are arranged to lead that way inward to a central point.

Line — The "line" of a display is the direction the viewer's eyes move across it. Line is next to color in importance when designing displays. Each line suggests something different.

- Vertical lines usually suggest stature and pride.
- Horizontal lines suggest an easy-going, restful quality. This is especially true for long, low, wide lines, such as the bands running across a window. A mix of horizontal lines with vertical ones can create a restful, yet elegant setting in a display.

Teacher Supplement 1

- Curved lines personify grace, charm, and femininity. Curved lines can be used to ease tension caused by too many vertical lines.
- Diagonal lines represent action. They are forceful and suggest movement and excitement.

Dominance — In every display composition, some element should be dominant. It should grab the most attention. In most displays, the dominant element is merchandise, but not always. An object may be made dominant by the arrangement of lines and shapes, the weights of various elements of the display, or graduations of color or light.

Repetition — The use of repetition in a display creates continuity, which is pleasing to the eye. Simply stated, repetition is the regular occurrence of an object or element throughout a display. It may occur as continuance of color, such as several variations of red. It may be repetition of shapes, such as shovels or batteries.

*Permission to duplicate this supplement is granted

Sales Promotion
Unit 14

Teacher Supplement 2—How To Sell With Colors

Keep It Simple

Working with color in a display can be as complex or simplistic as you want to make it. Artists beginning work in oils usually work with a palette that contains fewer than a dozen colors. And just as artists use a color wheel to guide them in mixing colors, so a display maker can use a color wheel to create harmony or contrast or inject a variety of tones and moods into a display by using simple guidelines from a color wheel.

The Color Wheel

A color wheel is built around the primary colors of red, yellow, and blue. If these colors are connected with straight lines, they form a triangle. Mixing any two primaries forms a secondary color that lies halfway between the two primaries. Mixing yellow and blue primaries gives a secondary of green. Mixing yellow and red primaries gives a secondary of orange. Mixing blue and red primaries gives a secondary of violet. When the three secondaries are connected with straight lines, they too form a triangle. Intermediate colors are formed by mixing secondary and primary colors. When orange (a secondary) is mixed with yellow (a primary) it gives the intermediate color of yellow-orange. Other intermediate colors are easy to mix and identify. When secondary colors are mixed, they form a tertiary (a third) color. The color wheel helps anyone visualize how colors can vary according to their relationship to the primaries of red, yellow, and blue.

The Moods of Color

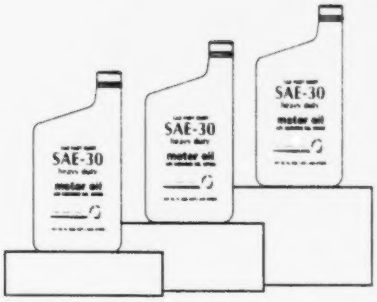
Colors do have moods. Reds, oranges, yellows, and some violets are warm. Greens, blues, and some violets are cool. Colors such as orange, yellow, and brown are said to be harmonious. These colors are next to each other on a color wheel. Colors that are opposite each other on a color wheel are referred to as complementary because when the two colors are combined, they form a neutral color. But complementary colors provide contrast too and can be effectively used for striking effects in displays.

Putting Color to Work in Displays

Keeping color simple may be the best approach to effective displays. Harmonious colors do extremely well with seasonal merchandise. Contrasting colors can draw attention to specials and promotions. Younger buyers like warm colors. Older buyers (supposedly) like the cool, subtle colors. When you're planning a display, think of color as a tool. Properly used, it will add appeal and impact to a display.

*Permission to duplicate this supplement is granted

Basic Display Arrangements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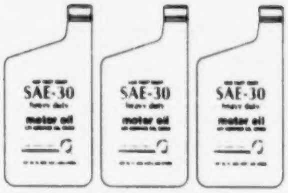
Stair step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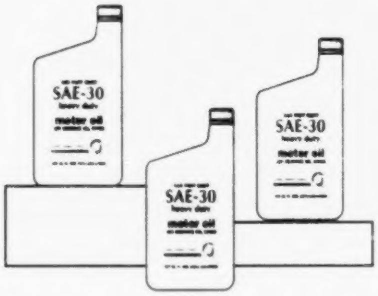
Repetition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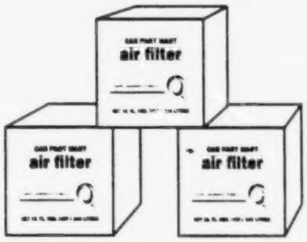
motor oil

Zig zag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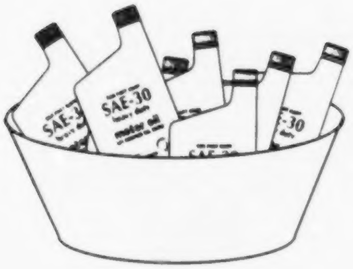
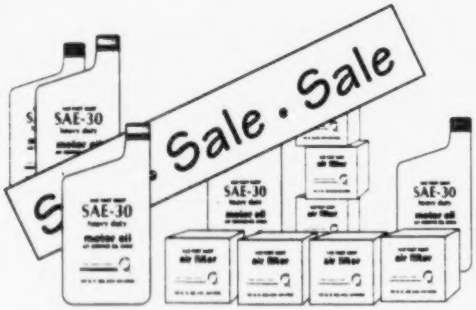
air filter
air filter

Pyramid



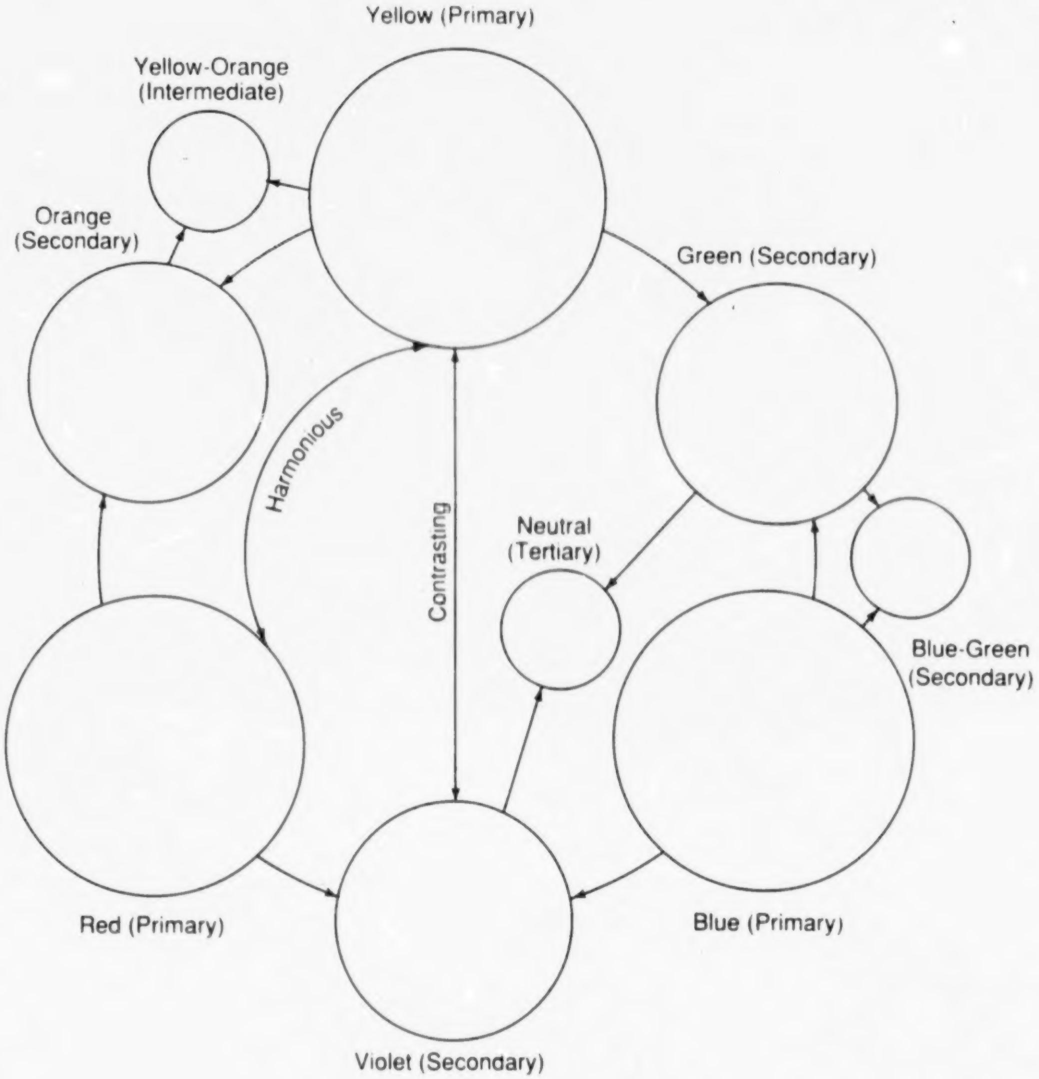
Dump


Sale . Sale . Sale
SAE-30
motor oil
SAE-30
SAE-30
air filter

Radiating

905

Color Wheel


Yellow (Primary)
Yellow-Orange (Intermediate)
Orange (Secondary)
Green (Secondary)
Harmonious
Contrasting
Neutral (Tertiary)
Blue-Green (Secondary)
Red (Primary)
Blue (Primary)
Violet (Secondary)

Sales Promotion
Unit 14

Information Sheet

1. **Terms and definitions related to sales promotion**

   a. **Advertising** — A means of informing potential customers so that they may choose more wisely from a variety of businesses, goods, and services available in their market area

   b. **"Closing a sale"** — Asking the customer for the order

   Example: "Which type of brake shoes do you need today—new or remanufactured?

   c. **Display** — The art of communicating with people visually in order to get their attention so that they will consider the purchase of a product

   d. **Display sketch** — The blueprint which shows what the display will look like and what is needed for assembly

   e. **Media** — The ways to reach people through advertising

   f. **Promotion** — Coordination of efforts to establish communication with potential customers

   g. **Prop** — Fixture used to build a display

   h. **Selling** — The process of determining the needs and wants of a customer and presenting a product, service, or idea in such a way that a customer is motivated to make a favorable buying decision

2. **Traits of a successful salesperson**

   a. **Confidence** — Faith or trust in one's actions and abilities

   Note: Self-confidence is an asset to a sales person, but giving the impression of over-confidence will lose many sales. Be pleasant, know yourself, know your product, and try to determine your customer's needs.

   b. **Perseverance** — To continue in a job or action despite opposition or discouragement

   c. **Honesty** — Fairness of conduct

   Note: Honesty in all matters will ultimately provide the positive results a sales person seeks. A single sale based on a dishonest presentation is a small reward compared with repeat sales and the good will of customers that come with being honest in your dealings.

Information Sheet

d. **Leadership** — The ability to positively influence another person to meet a common goal

e. **Reliability** — The ability to carry out duties or obligations consistently

f. **Tact** — The ability to say and do the right thing to maintain a good relationship with the customer

   Note: We've all heard that the "Customer is Always Right," but there will be times when the customer is, indeed, very wrong. Approach such a situation in a polite manner, always giving the customer a "way out" of his or her incorrect opinion when you must contradict them. Example: "Well, I'm not certain about the spark plug number you gave me, but this latest edition of the shop manual recommends an RBYL-12 for your vehicle."

g. **Poise** — Handling oneself in a self-assured, easy going manner

h. **Good grooming** — Having a clean and neat appearance and wearing clothes that are suitable to the business

i. **Enthusiasm** — Excitement in performing an activity

j. **Conversational ability** — The ability to communicate one's thoughts and ideas to another individual in a manner which can be easily understood

   Note: Engaging a customer in conversation allows a sales person to determine the customer's needs and find ways to meet those needs. Such a tactic many times leads to increased sales.

k. **Self-control** — The ability to control ones' emotions or actions in a given situation

   Note: Be professional. Whether the situation is good or bad, be professional. Never allow yourself to become angry, even if the customer is irate and acting ugly.

l. **Product knowledge** — Having facts about a product which can be translated into specific benefits that fulfill the customer's needs or wants

m. **Resourcefulness** — Ability to take action quickly in a new situation or unexpected difficulty

Information Sheet

3. Basic steps in selling

a. Preparation

- Have product knowledge.
- Know competitor's line.

b. Approach

Note: The customer's first impression of you is the one that they will remember.

- Be prompt, courteous, and provide a friendly atmosphere for the customer.
- Ask questions to determine customer needs, and listen.

c. Demonstration

- Personalize the product to fit customer's needs.
- Involve customer in demonstration.
- Know the merchandise.

  Note: A salesperson should never get between the product and the customer.

d. Overcoming customer objections

- Anticipate objections and prepare answers to them in advance.
- Know when to back off.

  Note: Accept what a customer says. Leave the door open to future sales opportunities.

e. Closing the sale.

- Watch for buying signals.

  Example: Customer getting checkbook and ink pen out

- Make a trial close.
- Promote related items.
- Ask for the order.
- Handle sales transactions.

Information Sheet

4. Procedure for waiting on customers

a. Recognize the customer.

Note: Always look each customer in the eye and greet them as they come into the store. Such a habit ensures each customer feels personally greeted, and it allows you to identify the person in the event he or she has ideas other than purchases in mind.

b. Write *entire* customer order on scratch pad.

Note: Be certain to take down vehicle or engine make, model, year, and serial number (if necessary) to make locating parts easier and more accurate.

c. Suggest related items, if appropriate.

Note: Sometimes customers forget, or don't know about, related parts or tools needed to complete a job, so it is helpful if the counterperson can anticipate these needs. In addition to increased sales, such a tactic can save the customer the time and trouble of coming back for additional parts.

Example: If a customer wants a set of brake shoes, ask if brake fluid, wheel or master cylinder kits, wheel bearing seals, or brake tools will be needed to complete the brake job.

d. Take scratch pad containing customer's entire order and look up all part numbers and prices before going to shelf.

Note: Be certain the parts you select from the catalog or computer are correct for the customer's vehicle or engine. Many times production changes take place in mid-year, giving two or more parts numbers for the same application. Be certain what you sell the customer is what he or she needs. Otherwise, there will be bad feelings when the customer must return the parts for the correct ones.

e. Go to bins and fill the order.

f. Invoice the sale.

g. Offer to pick up or order any parts that you do not have in stock.

h. If part boxes are dirty, dust them off and place customer's order in a sack or box.

Information Sheet

i. Thank customer and let him/her know you appreciate the business.

Note: In most towns there are a number of other parts stores, well stocked with similar items. A customer's selection of your store is an asset to you as a sales person, and you should let the customer know you appreciate the confidence he or she has placed in you, your store, and the parts you sell.

5. **Important sales promotion tools**

a. Displays

Note: Displays usually are the most important sales promotion tools for retail stores.

b. Catalogs

c. Contests

d. Coupons

e. Giveaways

f. Sampling

g. Banners and signs

6. **Types of displays**

a. Window

Examples: Open-backed, closed-back, island

b. Interior

Examples: Counter, display case, island

c. Outside

Examples: Signs, banners

Information Sheet

7. Purposes of displays

a. To attract customers' attention so that they will consider the purchase of a product

b. To educate customers about products and services

c. To establish and maintain a positive business image

d. To introduce new or seasonal items

8. Advantages of displays

a. Can involve real merchandise that can be examined by customers

b. Can be a relatively inexpensive means of promoting a product

c. Can be changed easily to reflect trends

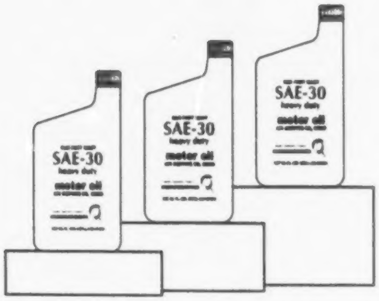
d. Can support advertising as part of a total promotional effort

e. Can help customers make buying decisions

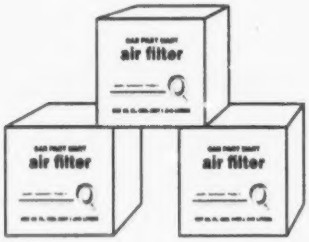
f. Can make large amounts of sale merchandise readily available to customers

9. Basic display arrangements

a. Stair step

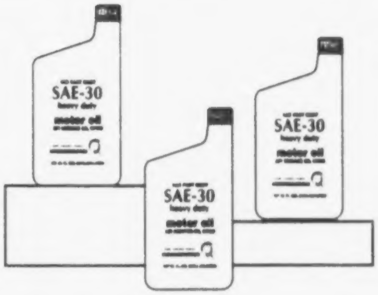

SAE-30
heavy duty
motor oil
SAE-30
heavy duty
motor oil
SAE-30
heavy duty
motor oil

b. Pyramid

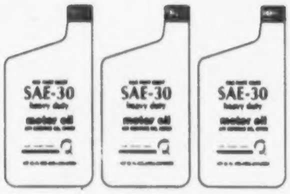

air filter
air filter
air filter

Information Sheet

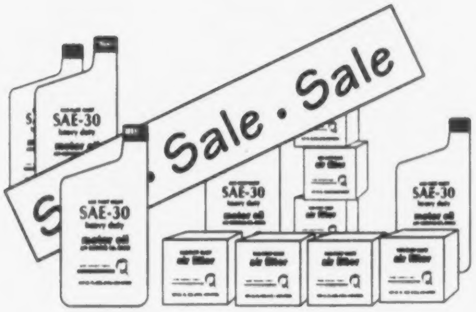
c. Zig zag


SAE-30
heavy duty
motor oil

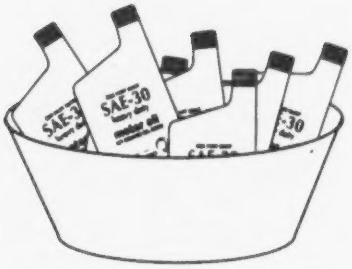
d. Repetition


SAE-30
heavy duty
motor oil

e. Radiating


Sale . Sale . Sale
SAE-30
heavy duty
motor oil
air filter

f. Dump


SAE-30
heavy duty
motor oil

10. Elements of good display design and their characteristics

a. **Line** — Calls attention to parts of the display to create harmony; directs eye through display

b. **Shape** — Physical appearance of items in a display; a variety of shapes are used in the backgrounds and arrangements for props, and as containers

c. **Size** — Can create special effects through contrast by using different sized items

Note: The size of objects presented in a display should be in proportion to each other.

d. **Weight** — The impression of weight created by the appearance of the display, affected by line, shape, size, color, and texture

e. **Texture** — The look or feel of the surface of an item; can be real or imagined

Information Sheet

f. **Color** — Affects customer's buying mood; attracts customers to display

Note: Too many colors in one display can confuse and even annoy a customer. Only one color should be dominant in a display.

11. **Common display materials**

a. Poster board

b. Paint/felt-tip pens

Note: Most poster board or felt-tip pens can be purchased as single items or in packets that include primary colors of yellow, red, and blue as well as several secondary colors.

c. Buildups

d. Lumber

e. Paper

f. Fabric

g. Props

h. Signs

i. Lights

j. Velcro strips

Note: Strips are easy to cut to size and make positioning signs a snap.

k. Hand and power tools

Examples: Scissors, hammer, staple gun, and saw

12. **Uses of colors in displays**

a. Color attracts attention to a display, and yellows, oranges, and reds are the best attention getters.

Examples: Fire trucks are red, yellow marks danger areas in plants, and orange marks dangerous equipment.

Information Sheet

b. Colors are generally classified as warm or cool and can be used to make a display snappy or subdued.

Examples: People are stimulated by the warmth of oranges and yellow while blues and violets tend to tone down a display, but subdued or not, blue is probably the favorite color for displays.

c. Colors next to each other on a color wheel are said to be harmonious and colors opposite each other on a color wheel are said to be in contrast; both harmony and contrast work well in displays, especially seasonal displays.

Examples: Greens and yellow show the exciting harmony of spring, oranges and blues show the warm contrast of summer, and brown to orange colors show the expansive harmony of fall.

d. Avoid mixing too many colors in a display or they will distract a viewers' eye from the message, and always avoid putting colors that clash anywhere near each other.

e. Both black and gray are good background colors or can be used as arrows, dots, or squares to focus attention on specific items in a display.

f. Color displays do not demand expensive paints or equipment; good displays can be made from inexpensive poster board and felt-tip pens.

13. Placement of interior displays

Note: To help prevent shoplifting, place interior displays where they will not block view from front to back of store.

a. Just inside front door

b. End of aisles

c. In areas where items normally are sold

d. Opposite service counters

e. Checkout counters

Note: Most impulse buying occurs at checkout counters.

f. Back of store

Note: The least valuable space is at the back of a store and heavy demand items should be placed there.

Information Sheet

14. Procedure for planning and creating a display

a. Set a budget for displays and know the specific cost of each planned display.

b. Select a product or products.

c. Develop an idea or theme.

d. Sketch the display design.

e. Select props.

f. Collect display materials needed in construction.

g. Construct the display.

h. Make necessary adjustments.

Note: Stand back and look at the display from all angles. View the display as a customer would.

i. Maintain the display.

Note: Keep aisles around display area clean and restock display as needed.

15. Guidelines for setting up interior displays

a. Design displays to show the products to their best advantage.

b. Use high intensity lighting or strong contrasts in display elements such as color, shape, and size.

c. Make sure display areas allow enough aisle space for customers to move freely about the store.

d. Place displays perpendicular to the main traffic aisle rather than parallel so customers can stop and examine products without blocking traffic.

e. Use space at the back of the store for products which demand special promotional effort.

f. Use large bold figures on show cards when price is important or a point needs to be emphasized.

g. Make sure arrangements of merchandise will allow customers to examine the product closely.

Information Sheet

16. Major advertising media advantages/disadvantages

Note: The most effective sales promotion is one in which a local business coordinates its advertising with the promotions done by manufacturers and suppliers. It is also important to remember that it is advertising which pays for television, radio, newspapers, and magazines.

a. Newspaper

- Advantages
  - — It is widely read.
  - — It is relatively inexpensive.
  - — It can be changed quickly.
- Disadvantage
  - — It has a short reading life.

    Note: A newspaper does not usually lie around long.

b. Magazine

- Advantages
  - — It adds prestige to a product or business.
  - — It can make effective use of color.
  - — It has a long reading life.
  - — It may reach a select audience.

    Examples: *Hot Rod* or *Car and Driver*
  - — It is a good medium for educating consumers about a product or service.
- Disadvantages
  - — It is relatively expensive.
  - — It may waste circulation unless business's trading area is quite large.
  - — It is not easy to change on short notice.

Information Sheet

c. Direct mail

- Advantages
  - It has direct and personal appeal to one carefully selected group.
  - It may be used to make immediate sales by enclosing an order blank.
  - It is relatively inexpensive if special postal rates can be obtained.
- Disadvantages
  - It requires that the mailing list be constantly revised.
  - It may be ignored by some people as "junk" mail.

d. Yellow Pages

- Advantages
  - It reaches a large, diversified audience.
  - it provides a permanent reference to special services and operating hours.
  - It is usually immediately available.
  - It is a highly promoted service.

Note: Studies by Chilton Research Services indicate that more than 75 million people inquire about auto parts and supplies every year, and more than 40 million of these people use the Yellow Pages.

- Disadvantages
  - It is difficult to show or demonstrate product.
  - It is difficult to use for seasonal or special sales efforts.

Information Sheet

e. Radio

- Advantages
  - It is suited for products of general demand because of large diversified audience.
  - It can be changed easily.
  - It can be repeated frequently.
  - It is relatively inexpensive.
- Disadvantages
  - It may waste coverage on many people who are not potential customers.
  - It is not suited for products that must be seen to develop customer interest.

f. Television

- Advantages
  - It has a large diversified audience.
  - It is good for national advertising.
  - It adds prestige to a product or business.
  - It is easy to demonstrate a product.
- Disadvantages
  - It is expensive.
  - It may waste coverage on viewers not interested in product.

17. Factors to consider in selecting advertising media

a. How many potential customers will be reached and what is the cost per prospect?

b. Can selling message be repeated?

c. Does the media create attention, interest, desire, and action?

Information Sheet

d. Does the media fit store's image?

e. Will media reach more than desired market area?

f. Is media flexible for copy changes?

g. Can store afford to advertise in selected media?

Sales Promotion
Unit 14

Assignment Sheet 1—Plan a Display

Name ____________________ Overall Rating ____________

Evaluation criteria	**Rating**
Plan relates well to product	____
Overall effectiveness	____

Introduction: Promotion involves presenting a product in a manner that attracts a potential customer's attention. One of the methods many store owners use to accomplish this is displaying the product in an attractive manner to remind customers the product is available and desirable. In this assignment, you will select a product and plan your display.

Directions: Using the information sheet in this unit as a guide, plan a display for a popular product that may be found in a parts store.

A. Name of product to be displayed ____________________

B. Idea or theme ____________________

C. Color scheme ____________________

D. Desired location of display ____________________

E. Display arrangement (stair step, zig zag, pyramid, etc.) ____________

F. Props to be used ____________________

____

G. Equipment and materials needed for construction ____________

____

____

H. Display sketch

Note: Use labels to indicate size, shape, and distance of items. Draw your sketch on the back of this page and be sure to save the sketch and props and equipment and materials information for use with Job Sheet 1.

Sales Promotion
Unit 14

Assignment Sheet 2—Solve Problems Concerning Sales Promotion

Name ______________________________ Overall Rating ____________

Evaluation criteria	Rating
Logical reasoning demonstrated	____
Neat, legible handwriting	____
Answered in complete sentences	____

Introduction: Knowing how to meet your customer's wants and needs can make the difference in being successful in the parts business. There are basic selling techniques that can provide a salesperson with the tools to be successful. It is also important to know how to promote the products and services that your store offers. In this assignment, you will be asked to solve problems using the skills that you developed in this unit.

Directions: After reading each scenario, answer the questions that follow. Answers should be stated in complete sentences and reflect your knowledge of basic sales and promotion techniques.

A. Mr. Vasquez has just been to one of your competitor's and complains that he could not get anyone to help him select a new set of tires for his 1990 Dodge Caravan. His voice and mannerisms indicate that he is still upset about being ignored at the other store. Mr. Vasquez says the other store has a sale on tires and he wants to know if you can sell him comparable tires for the same price. What sales techniques would you use to handle Mr. Vasquez and "close the sale?"

____

____

____

____

____

____

____

Assignment Sheet 2

B. James was handling phone orders for Southwest Parts Supply. Since orders had slowed down some, James decided to take a break. He was drinking a cola and munching on some chips when the phone rang. It was Martina at Silver's Garage and they needed several parts to be delivered as soon as possible. James did not have an order pad in front of him so he grabbed a napkin and wrote the parts needed, engine model, and make of vehicle on that. James waited until he had finished his snack before filling Martina's order. James hurriedly looked up the parts, pulled the items from the bins, and placed them in a box for delivery. However, James forgot to tell anyone that this was a rush order. The order sat until after lunch and was finally delivered at 2:30 p.m. At 2:45, Mr. Silver called the manager of Southwest Parts Supply and told him that he was angry because the order was not delivered promptly and they did not receive all the parts needed for the job. Before hanging up, Mr. Silver said that he would no longer rely on Southwest Parts Supply for his parts and that he was taking his business to a competitor. What did James do wrong? How would you have handled this order?

C. Jesse has been asked to design and construct a display for heavy duty motor oil. His supervisor has given Jesse the following instructions: the display should be in a prominent place, but take up limited space; it needs to be built for as little money as possible; Jesse needs to use materials found around the store, if possible; and, since red is the manager's favorite color, she wants Jesse to use red in the display.

Where would you place your display? ______________________

What idea or theme would you use? ______________________

What design arrangement would you use? ______________________

What colors would you use in the display? ______________________

Assignment Sheet 2

What display materials would you use? ______________________________

Sketch the display design below.

D. A store is planning its annual advertising budget and wants to reach as many people as possible to talk about their free local delivery service, their stock of foreign car parts, and their operating hours. What advertising medium would you recommend? Why?

E. A store wants to promote a new tool that is difficult to talk about, but easy to explain with an illustration. Since the budget is limited, which advertising medium do you suggest? Why?

Sales Promotion
Unit 14

Job Sheet 1—Construct a Display

Name ______________________________ Attempt Number ________

Date ______________________________ Overall Rating ________

Evaluation criteria	**Rating**
Display constructed according to plan	______
Display relates well to product	______
Overall effectiveness	______

A. Equipment and materials

Note: Refer to your display plan prepared in Assignment Sheet 2 for a specific list of equipment and materials needed to construct the display.

B. Procedure

☐ 1. Obtain a copy of the display plan.

☐ 2. Assemble equipment and materials according to plan.

☐ 3. Build the basic foundation.

Note: Provide the necessary strength and safety to support display materials.

☐ 4. Provide for utilities such as electricity to operate lights and motors used in display.

Caution: Keep wiring out of sight and place cords carefully to prevent someone from tripping or damaging the display.

☐ 5. Cover background and flooring with designated materials such as paint, paper, drapes,and fabric.

Note: One person is usually needed to hold materials while another staples materials in place.

Job Sheet 1

☐ 6. Position props according to plan and secure.

Note: Keep positioning until parts are displayed to best advantage.

☐ 7. Add related accessories to provide realism.

☐ 8. Position and secure signs.

Note: Signs should be placed where they can be easily read by a customer.

☐ 9. Proofread the signs and check the background and covering for any needed touch up.

☐ 10. Evaluate display, checking it from several different angles, and make any necessary changes to make display more effective.

☐ 11. Return equipment and materials to storage.

☐ 12. Clean the work area.

Evaluator's comments: ____________________

____

____